MINUTES OF PROCEEDINGS

OF THE

ROYAL SOCIETY OF CANADA

1961

THIRD SERIES, VOLUME LV

PROCÈS-VERBAUX

DE LA

SOCIÉTÉ ROYALE DU CANADA

1961

TROISIÈME SÉRIE, TOME LV

OTTAWA
ROYAL SOCIETY OF CANADA

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1935—ARCHIBALD, E. S., C.B.E., B.S.A., LL.D., D.Sc., 185 Stanley Ave., Ottawa, Ont.

Active Members

1943—FINN, D. B., C.M.G., B.Sc., M.Sc., Ph.D., Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, Rome, Italy.

1942—KLINCK, LEONARD S., B.S.A., M.S.A., D.Sc., LL.D., 2627 Marine Drive, West Vancouver, B.C.

1941—MACKENZIE, C. J., C.M.G., M.C., D.Eng., D.Sc., LL.D., D.C.L., F.R.S., 210 Buena Vista Road, Rockcliffe, Ont.

1937—MORGAN, A. E., M.A., LL.D., Toynbee Hall, Commercial Street, London, E.1, England

1952—VANDRY, Mgr F., C.M.G., P.A., D.Th., Ph.D., Ch. Légion d'honneur, Séminaire de Québec, Québec (P.Q.)

SECTION I—HUMANITÉS ET SCIENCES SOCIALES

Membres à la retraite

1942—FRÉMONT, DONATIEN, B.A., Ch. Légion d'honneur, 1628, avenue Leclair, Verdun, Montréal (P.Q.)

1926—LANCTÔT, GUSTAVE, B.Litt., D.Litt., LL.M., Ch.Légion d'honneur, 154, avenue Daly, Ottawa (Ont.) (ancien président)

Membres actifs

1956—AUDET, LOUIS-PHILIPPE, B.A., B.Péd., L.ès Sc., D.Péd., directeur des études et coordonnateur des programmes des institutions relevant du Ministère du Bien-être social de la province de Québec, 3,400, av. Ridgewood, app. 1, Montréal 26 (P.Q.) (Life Member)

1958—BAUDOUIN, L. M., Docteur en droit ès sciences juridiques, docteur en droit ès sciences politiques, professeur faculté de droit, Université McGill, Montréal (P.Q.)

1958—BEAULIEU, MARIE LOUIS, B.A., L.Ph., LL.L., LL.D., professeur aux facultés de Droit, de Sciences Sociales, d'arpentage et de Génie Forestier de l'Université Laval, 17, rue Ste-Famille, Québec (P.Q.)

1957—BEAULIEU, PAUL, B.A., LL.L., Ambassadeur, Ambassade du Canada, Boîte postale 2300, Beyrouth, Liban.

1958—Béraud, Jean, B. A., Chef des rubriques Théâtre-Musique-Cinéma-Littérature, *La Presse*, rue St-Jacques, Montréal (P.Q.)

1943—Bernard, Harry, B.A., L.ès L., D.ès L., 665, rue Sainte-Anne, Saint-Hyacinthe (P.Q.)

1960—Boissonnault, Charles-Marie, 985, Calixa Lavallée, Québec (P.Q.)

1954—Bonenfant, Jean-Charles, B.A., LL.L., Bibliothèque de la Législature provinciale, Hôtel du Gouvernement, Québec (P.Q.)

1954—Brouillette, Benoît, B.A., L.S.C., D.U.P., 535, avenue Viger, Montréal 24 (P.Q.)

1940—Bruchési, Son Ex. Jean, B.A., LL.L., D.ès Sc.Pol., D.ès L., Chevalier de la Légion d'honneur, Ambassadeur du Canada à Madrid, Apartado 587, Madrid, Espagne (ancien président)

1947—Carbotte, Mme Gabrielle Roy, 135 ouest, Grande Allée, Québec (P.Q.)

1948—Chabot, Mlle Cécile, 2435, avenue Maplewood, Montréal (P.Q.)

1916—Chartier, Mgr Emile, M.A., D.Phil., D.ès L., LL.D., L.ès L., Ph.D., 605, rue Villeneuve, Sherbrooke (est) (P.Q.)

1961—Dagenais, Pierre, B.A., L.ès Sc., L.ès L., D. de l'U., Directeur de l'Institut de Géographie, Université de Montréal, C.P.6128, Montréal (P.Q.)

1939—Daviault, Pierre, Surintendant du Bureau des traductions de l'État, 1936 Rideau Garden Drive, Ottawa (Ont.) (ancien président)

1945—De Koninck, Charles, Ph.D., Université Laval, Québec (P.Q.)

1961—Dion, M. l'abbé Gérard, B.A., L.Th., L.Phil., M.Sc.Soc., Professeur Faculté des sciences sociales, Université Laval, Québec (P.Q.)

1957—Douville, Raymond, B.A., 845, Madeleine-de-Verchères, Québec (P.Q.)

1959—Dubé, Marcel, B.A., 6955, avenue Fielding, app. 412, Montréal (P.Q.)

1960—Dufresne, Jean (Marcel Valois), B.ès L., Professeur honoraire de la faculté de musique de l'Université de Montréal, 4142, rue Saint-Denis, Montréal (P.Q.)

1960—Duhamel, Roger, LL.L., Imprimeur de la Reine, Hôtel du Gouvernement, Ottawa (Ont.)

1955—Elie, Robert, B.A., Directeur général de l'Ecole des Beaux-Arts de Montréal et de l'Ecole d'Architecture, Montréal (P.Q.)

1954—Falardeau, Jean-C., M.A., L.Ph., Université Laval, Québec (P.Q.)

1956—Faribault, Marcel, B.A., LL.L., LL.D., D.C.L., Président et directeur général du Trust Général du Canada, 640, avenue Dunlop, Outremont, Montréal (P.Q.)

1961—Filiatrault, Jean, Directeur du service français de Vickers & Benson Advertising Ltd., Edifice Keefer, 1440 ouest, rue Ste-Catherine, Montréal (P.Q.)

1948—Garneau, René, B.A., L.ès L., Ch. de la Légion d'honneur, 35, rue de la Science, Bruxelles, Belgique

1957—Gauthier, Robert, B.A., Ph.L., B.Paed., D.Paed., Directeur de l'enseignement français en Ontario, Ministère de l'Education, 473, rue Wilbrod, Ottawa (Ont.)

1942—Gauvreau, Jean-Marie, D.Sc.P., Officier d'académie (France), Directeur de l'Institut des arts appliqués de la province de Québec, 1430, rue Saint-Denis, Montréal 18 (P.Q.)

1958—Gélinas, Gratien, D.ès L., Directeur, La Comédie-Canadienne Inc., 84 ouest, rue Ste-Catherine, Montréal (P.Q.)

1959—Giroux, André, Ministère de l'Industrie et du Commerce, Hôtel du Gouvernement, Québec (P.Q.)

1939—Gouin, l'Hon. Léon Mercier, B.A., LL.L., LL.D., C.R., D.Sc.Pol., Off. d'inst. publique, Ch. Légion d'honneur, 204 ouest, Notre Dame, suite 33, Montréal (P.Q.)

1957—Gouin, Paul E., LL.L., D.ès L., Conseiller technique auprès du Conseil Exécutif de la Province de Québec, 2100, rue Drummond, Montréal (P.Q.)

1960—Grignon, Claude-Henri, Sainte-Adèle, comté de Terrebonne (P.Q.)

1961—Guèvremont, Mme Germaine, D.ès L., 1010 est, rue Sherbrooke, Montréal (P.Q.)

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1956—LAMONTAGNE, MAURICE, L.Sc.Soc., M.A., Université d'Ottawa, Ottawa (Ont.)
1953—LAURENCE, JEAN-MARIE, B.A., 685, Place de Bruyère, Ste-Foy, Québec (P.Q.)
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1947—LEBEL, MAURICE, M.A., L.ès L., Ph.D., D.Litt., Faculté des Lettres, Université Laval, Québec (P.Q.)
1956—LEFEBVRE, JEAN-JACQUES, B.Litt., Archiviste en chef, Cour supérieure, Palais de Justice, Montréal 1 (P.Q.)
1957—LEGAULT, le R. P. ÉMILE, B.A., Directeur de la revue L'Oratoire, Oratoire Saint-Joseph, Montréal (P.Q.)
1949—LEMELIN, ROGER, journaliste, 71, rue Saint-Pierre, Québec (P.Q.)
1949—LÉVESQUE, O. P., T. R. Père GEORGES-HENRI, B.A., L.Th., Dipl. Sc.-Soc., Maison Montmorency, 2490, avenue Royale, Courville, Québec 5 (P.Q.)
1944—L'HEUREUX, EUGÈNE, B.A., LL.L., 806, rue Madeleine-de-Verchères, Québec (P.Q.)
1958—LOCKQUELL, Frère CLÉMENT, B.A., M.A., Ph.D., Doyen de la Faculté de Commerce, Université Laval, Québec (P.Q.)
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1953—LORTIE, LÉON, B.A., L.ès Sc., D.ès Sc., Université de Montréal, Montréal (P.Q.)
1941—MAHEUX, Mgr ARTHUR, O.B.E., M.A., D.Th., Université Laval, Québec (P.Q.)
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1953—RÉGIS, le R. P. LOUIS-MARIE, O.P., Ph.D., Doyen de la faculté de philosophie, Université de Montréal, Montréal (P.Q.)
1948—ROY, ANTOINE, D.ès L., Archiviste de la Province de Québec, Québec (P.Q.)
1951—SYLVESTRE, GUY, L.Ph., M.A., 1870 Rideau River Drive, Ottawa (Ont.)
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1958—VINAY, JEAN-PAUL, B.A., M.A.(London), L.ès L., D.E.S. (Paris), Agrégé de l'université de France, Officier d'Académie, Directeur, Section de Linguistique, Université de Montréal, Montréal (P.Q.)
1960—VINETTE, ROLAND, B.A., L.Péd., D.Péd., 840, rue Sir Adolphe Routhier, Québec (P.Q.)

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1942—Humphrey, George, M.A., Ph.D., Oxford University, Oxford, England
1929—Jenness, Diamond, M.A., Litt.D., 108 Broadway Ave., Ottawa, Ont.
1935—Kennedy, W. P. M., M.A., LL.B., Litt.D., LL.D., Docteur en Droit, 77 Spadina Rd., Toronto, Ont.
1929—Landon, Fred, M.A., LL.D., D.Litt., 846 Hellmuth Ave., London, Ont.
1953—Leechman, J. D., M.A., Ph.D., 3807 Seventh St. S.W., Calgary, Alta.
1946—Lodge, R.C., M.A., 775 Dade Boulevard, Miami Beach 39, Florida, U.S.A.
1943—Logan, H. A., A.B., Ph.D., Stouffville, Ont.
1937—MacGibbon, D. A., M.A., Ph.D., LL.D., 33 Norfolk St. North, Hamilton, Ont.
1921—MacIver, R. M., M.A., D.Phil., D.Sc., LL.D., Litt.D., L.H.D., Heyhoe Woods, Palisades, N.Y.C., U.S.A.
1949—Marshall, Herbert, O.B.E., B.A., Box 506, R.R.1, Rothwell Heights, Ottawa, Ont.
1946—Meek, T. J., B.D., D.D., Ph.D., University of Toronto, Toronto, Ont.
1942—Michell, Humfrey, M.A., Box 611, Lennoxville, P.Q.
1926—Pierce, Lorne, M.A., Th.D., D.D., LL.D., Litt.D., D.ès L., "South Ridge" 309, Glen Elm Ave., Toronto 7, Ont.
1930—Pratt, E. J., C.M.G., M.A., Ph.D., Litt.D., LL.D., D.C.L., 47 Glencairn Ave, Toronto, Ont.
1936—Raymond, W. O., M.A., L.Th., Ph.D., D.C.L., 11 Montclair Ave., Toronto, Ont.
1933—Stanley, Carleton, M.A., LL.D., Litt.D., Uxbridge, Ont.
1942—Stevenson, G. H., M.D., 2482 Kuhio Ave., Honolulu 15, Hawaii
1941—Thompson, H. A., M.A., Ph.D., LL.D., Institute for Advanced Study, Princeton, N.J., U.S.A.
1928—Wallace, W. S., M.A., LL.D., 12 Admiral Rd., Toronto, Ont.

Active Members

1937—Anderson, F. H., M.A., Ph.D., LL.D., Head, Department of Philosophy, University of Toronto, Toronto, Ont.
1939—Angus, H. F., M.A., B.C.L., LL.D., 1345 West 58th Avenue, Vancouver 14, B.C. (Past President)
1959—Bagnani, Gilbert F., D.Litt., Professor of Classics, University College, University of Toronto, Toronto, Ont.
1951—Bailey, A. G., M.A., Ph.D., Dean of Arts and Professor of History, University of New Brunswick, Fredericton, N.B.
1961—Bayley, C. C., M.A., Ph.D., Professor, Department of History, McGill University, Montreal, P.Q.
1954—Birney, A. E., M.A., Ph.D., Professor of English, University of British Columbia, Vancouver, B.C.
1957—Bissell, C. T., M.A., Ph.D., D.Litt., LL.D., President, University of Toronto, Toronto, Ont.
1943—Bladen, V. W., M.A., Dean, Faculty of Arts, University of Toronto, Toronto, Ont.
1957—Boeschenstein, Hermann, Ph.D., Professor of German, University College, University of Toronto, Toronto, Ont.

1938—BRADY, ALEXANDER, M.A., Ph.D., Department of Political Economy, University of Toronto, Toronto, Ont.

1950—BRITNELL, G. E., M.A., Ph.D., Head, Department of Economics and Political Science, University of Saskatchewan, Saskatoon, Sask.

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1931—PEARCE, J. A., M.A., D.Sc., Ph.D., Director Emeritus, Dominion Astrophysical Observatory, Victoria, B.C. (Past President)

1960—PEARSON, W. B., D.F.C., M.A., D.Phil., Senior Research Officer, National Research Council, Ottawa, Ont.

1935—PENFIELD, WILDER G., O.M., C.M.G., Litt.B., M.D., M.A., B.Sc., D.Sc., F.R.S., Montreal Neurological Institute, Montreal, P.Q.

1940—PETRIE, R. M., M.B.E., A.M., Ph.D., Dominion Astrophysicist, Dominion Astrophysical Observatory, Royal Oak, B.C.

1950—PETRIE, WILLIAM, A.M., Ph.D., Superintendent, Operational Research Group, Defence Research Board, Ottawa, Ont.

1955—PICKUP, ERIC, M.B.E., B.Sc., M.Sc., Ph.D., Research Officer, Physics Division, National Research Council, Ottawa, Ont.

1942—PIDGEON, L. M., M.B.E., B.Sc., M.Sc., Ph.D., Head, Department of Metallurgical Engineering, University of Toronto, Toronto, Ont.

1927—POITEVIN, EUGÈNE, C.E., B.A.Sc., D.Sc., 1864 Rideau River Drive, Ottawa, Ont.

1948—POMERLEAU, RENÉ, B.S.A., M.Sc., D.Sc., Laboratoire de Recherches forestières, C.P. 35, Sillery, P.Q.

1946—PORSILD, A. E., M.B.E., Ph.D., Chief Botanist and Curator of the National Herbarium of Canada, National Museum, Ottawa, Ont.

1942—PRÉFONTAINE, GEORGES, B.A., M.D., L.ès Sc., 5689 boulevard Rosemont, Montréal, P.Q.

1960—PREST, V. K., B.Sc., M.Sc., Ph.D., Chief, Pleistocene, Engineering and Groundwater Section, Geological Survey of Canada, Ottawa, Ont.

1961—PRESTON, M. A., M.A., Ph.D., Professor of Physics, McMaster University, Hamilton, Ont.

1955—PRINGLE, ROBERT, B.Sc., Ph.D., 91 Ravelston Dykes, Edinburgh, Scotland.

1949—PUDDINGTON, I. E., M.Sc., Ph.D., Director, Division of Applied Chemistry, National Research Council, Ottawa, Ont.

1949—PURVES, C. B., B.Sc., Ph.D., D.Sc., E. B. Eddy Professor of Industrial and Cellulose Chemistry, McGill University, Montreal, P.Q.

1953—QUASTEL, J. H., A.R.C.S., D.Sc., Ph.D., F.R.S., Professor of Biochemistry, McGill University, Montreal, and Director, McGill–Montreal General Hospital Research Institute, Montreal, P.Q.

1959—RADFORTH, NORMAN W., M.A., Ph.D., Professor, Department of Biology, Hamilton College, McMaster University, London, Ont.

1954—RAYMOND, MARCEL, L.Sc., Botaniste, taxonomiste, Jardin Botanique de Montréal, Montréal P.Q.

1956—REMPEL, J. G., M.Sc., Ph.D., Professor, Department of Biology, University of Saskatchewan, Saskatoon, Sask.

1957—RHODES, A. J., M.B., Ch.B., M.D., F.R.C.P.(Edin.), Professor of Microbiology and Director, School of Hygiene, University of Toronto, Toronto, Ont.

1946—RICE, H. M. A., M.A.Sc., Ph.D., Chief Geological Editor, Geological Survey of Canada, Ottawa, Ont.

1936—RICKABY, H. C., M.A., 27 First Street, Oakville, Ont.

1956—RICKER, W. E., M.A., Ph.D., Editor, Fisheries Research Board of Canada, Biological Station, Nanaimo, B.C.

1956—RIDDELL, J. E., B.Eng., M.Sc., Ph.D., Department of Geology, Carleton University, Ottawa, Ont.

1954—RISI, JOSEPH, L.Sc., D.Sc., Faculty of Forest Engineering, Laval University, Quebec, P.Q.

1960—ROBINOW, C. F., M.D., Professor, Department of Bacteriology and Immunology, University of Western Ontario, London, Ont.

1944—ROBINSON, GILBERT DE B., M.B.E., Ph.D., Professor, Department of Mathematics, University of Toronto, Toronto, Ont.

1954—ROBINSON, S. C., M.A.Sc., Ph.D., Chief, Mineralogy Division, Geological Survey of Canada, Ottawa, Ont.

1956—ROBSON, J. M., M.A., Physics Department, University of Ottawa, Ottawa, Ont.

1954—ROLIFF, W. A., B.Sc., M.Sc., Manager, Eastern Division, Producing Dept., Imperial Oil Ltd., 111 St. Clair Ave. West, Toronto, Ont.

1961—ROSE, BRAM, B.A., M.D., C.M., M.Sc., Ph.D., Allergist-in-chief, Director of

Division of Immunochemistry and Allergy, University Clinic, and Physician, Department of Medicine, Royal Victoria Hospital, Montreal, P.Q.

1936—Rose, D. C., O.B.E., B.Sc., M.Sc., Ph.D., Principal Research Officer, Division of Pure Physics, National Research Council, Ottawa, Ont.

1954—Rossiter, R. J., B.Sc., M.A., D.Phil., B.M.B.Ch., D.M., Department of Biochemistry, University of Western Ontario, London, Ont.

1942—Rousseau, Jacques, B.A., L.Sc., D.Sc., Ph.D., C.P. 188, Saint Jean Port Joli, P.Q.

1936—Russell, L. S., B.Sc., M.A., Ph.D., LL.D., Director, National Museum of Canada, Ottawa, Ont.

1947—Sandin, R. B., M.Sc., Ph.D., University of Alberta, Edmonton, Alta.

1941—Sargent, B. W., M.B.E., M.A., Ph.D., R. Samuel McLaughlin Research Professor of Physics and Head of Department, Queen's University, Kingston, Ont.

1954—Satterly, Jack, M.A., Ph.D., Geologist, Ontario Department of Mines, Toronto, Ont.

1952—Scherk, Peter, Ph.D., Professor, Department of Mathematics, University of Toronto, Toronto, Ont.

1951—Schneider, W. G., B.Sc., M.Sc., Ph.D., Principal Research Chemist, National Research Council, Ottawa, Ont.

1941—Selye, Hans, M.D., Ph.D., D.Sc., Institut de Médecine et de Chirurgie Expérimentales, Université de Montréal, Montréal, P.Q.

1955—Senn, H. A., M.A., Ph.D., Director of the Biotron, Birge Hall, University of Wisconsin, Madison, Wis., U.S.A.

1946—Shaner, R. F., Ph.B., Ph.D., Professor of Anatomy, University of Alberta, Edmonton, Alta.

1923—Shaw, A. Norman, M.A., D.Sc., LL.D., 2125 Sunset Rd., Montreal 16, P.Q.

1961—Shaw, Denis M., M.A., Ph.D., Professor, Department of Geology, McMaster University, Hamilton, Ont.

1935—Shrum, G. M., O.B.E., M.A., Ph.D., Professor and Head, Department of Physics, University of British Columbia, Vancouver, B.C.

1935—Sifton, H. B., M.A., Ph.D., 198 Bessborough Drive, Toronto 17, Ont.

1940—Simard, L. C., M.D., F.R.C.P.(C), 624 Dunlop, Outremont (Montréal), P.Q.

1938—Slipper, S. E., B.Sc., 17720 Talbot Road, Edmonds, Wash., U.S.A.

1940—Smith, H. Grayson, M.B.E., M.A., Ph.D., Head, Department of Physics, University of Alberta, Edmonton, Alta.

1948—Solandt, O.M., O.B.E., B.Sc., M.A., M.D., D.Sc., M.R.C.P., LL.D., Vice-President, Research and Development, Canadian National Railways, 360 McGill St., Montreal, P.Q.

1951—Speakman, H. B., B.Sc., M.Sc., D.Sc., LL.D., 35 Strathearn Blvd., Toronto, Ont.

1943—Spinks, J. W. T., M.B.E., D.Sc., Ph.D., LL.D., President, University of Saskatchewan, Saskatoon, Sask.

1955—Sproule, J. C., B.Sc., M.A., Ph.D., J. C. Sproule and Associates, Geological Consultants, 1009–4th Ave. S.W., Calgary, Alta.

1934—Steacie, E. W. R., O.B.E., M.Sc., Ph.D., D.Sc., LL.D., D. de l'U., F.R.S., President, National Research Council, Ottawa, Ont. (Past President)

1949—Sternberg, C. M., LL.D., 169 Holmwood Ave., Ottawa, Ont.

1961—Stelck, C. R., B.Sc., M.Sc., Ph.D., Professor, Department of Geology, University of Alberta, Edmonton, Alta.

1949—Stevenson, J. S., B.A.Sc., Ph.D., Department of Geological Sciences, McGill University, Montreal, P.Q.

1936—Stockwell, C. H., B.A.Sc., Ph.D., Chief, Precambrian Division, Geological Survey of Canada, Ottawa, Ont.

1939—Swanson, C. O., M.A.Sc., Ph.D., Chief Geologist, Consolidated Mining & Smelting Co., Ltd., Trail, B.C.

1927—Tanton, T. L., M.A., Ph.D., Consulting Geologist, 9 Grosvenor Ave., Ottawa, Ont.

1957—TARR, H. L. A., M.S.A., Ph.D.(McGill), Ph.D.(Cantab.), Fisheries Research Board Technological Station, 6649 N.W. Marine Drive, Vancouver, B.C.

1934—TAYLOR, N. B., M.D., F.R.C.S., M.R.C.S., 21 Ardwold Gate, Toronto, Ont.

1950—TEMPLEMAN, W., O.B.E., B.Sc., M.A., Ph.D., Director, Fisheries Research Board, Biological Station, St. John's, Newfoundland

1959—THIESSEN, G. J., B.Sc., M.Sc., Ph.D., Principal Research Officer, National Research Council, Ottawa, Ont.

1943—THODE, H. G., M.B.E., M.Sc., Ph.D., D.Sc., F.R.S., President, McMaster University, Hamilton, Ont. (Past President)

1947—THOMPSON, I. M., B.Sc., M.B., Ch.B., F.R.S.E., Professor of Anatomy and Chairman of the Department, University of Manitoba Medical College, Winnipeg, Man.

1921—THOMPSON, W. P., M.A., Ph.D., D.Sc., LL.D., University of Saskatchewan, Saskatoon, Sask. (Past President)

1949—THOMPSON, W. R., B.S.A., D.Sc., Ph.D., F.R.S., 25 Cartier St., Ottawa, Ont.

1935—THOMSON, ANDREW, O.B.E., M.A., D.Sc., 36 Russell Hill Rd., Toronto 7, Ont.

1936—THOMSON, D. L., M.A., D.Sc., Ph.D., LL.D., Vice-Principal, Dean of the Faculty of Graduate Studies, Professor of Organic and Biological Chemistry, McGill University, Montreal, P.Q.

1945—THOMSON, J. E., M.A., Ph.D., Assistant Provincial Geologist, Department of Mines, Toronto, Ont.

1960—THORSTEINSSON, R., M.A., Ph.D., Geologist, Geological Survey of Canada, Ottawa, Ont.

1926—THORVALDSON, T., Commander, Order of the Falcon(Iceland), M.A., Ph.D., D.Sc., LL.D., University of Saskatchewan, Saskatoon, Sask.

1950—TREMBLAY, J.-L., B.Sc.A., Ph.D., D.Sc., Département de Biologie, Faculté des Sciences, Université Laval, Québec, P.Q.

1958—TUTTE, W. T., M.A., M.Sc., Ph.D., Assistant Professor, Department of Mathematics, University of Toronto, Toronto, Ont.

1955—VENNING, ELEANOR H., M.Sc., Ph.D., Department of Endocrinology, Royal Victoria Hospital, Montreal, P.Q.

1948—VOLKOFF, G. M., M.B.E., M.A., Ph.D., D.Sc., Professor of Physics, University of British Columbia, Vancouver, B.C.

1937—WALKER, J. F., B.A.Sc., Ph.D., 3014 Oakdowne Road, Victoria, B.C.

1958—WALKER, NORMA FORD, B.A., Ph.D., Department of Zoology, University of Toronto, and Director, Department of Genetics, Hospital for Sick Children, Toronto, Ont.

1957—WARD, ARTHUR G., M.A., Research Officer, Atomic Energy of Canada Ltd., Chalk River, Ont.

1959—WARREN, J. B., B.Sc., Ph.D., A.R.C.S., Professor of Physics, University of British Columbia, Vancouver, B.C.

1945—WARREN, H. V., B.A.Sc., B.Sc., D.Phil., Professor, Department of Geology and Geography, University of British Columbia, Vancouver, B.C.

1931—WARREN, P. S., Ph.D., A.R.C.S., 8209–112 Street, Edmonton, Alta.

1930—WASTENEYS, H., Ph.D., Professor Emeritus of Biochemistry, University of Toronto, Toronto, Ont.

1953—WATSON, J. W., M.A., Ph.D., Professor of Geography, Edinburgh University, Edinburgh, Scotland

1937—WATSON, W. H., M.A., Ph.D., Professor and Head, Department of Physics, and Director, Computation Centre, University of Toronto, Toronto, Ont.

1953—WEEKS, L. J., B.Sc., M.A., Ph.D., Geologist, Geological Survey of Canada, Ottawa, Ont.

1960—WELD, C. B., M.A., M.D., L.M.C.C., Professor, Department of Physiology, and Chairman, Division of Biological Sciences, Dalhousie University, Halifax, N.S.

1952—Welsh, H. L., M.A., Ph.D., Professor of Physics, University of Toronto, Toronto, Ont.

1961—Westman, A. E. R., M.A., Ph.D., Director of Research, Ontario Research Foundation, Toronto 5, Ont.

1955—Wetmore, F. E. W., B.Sc., M.A., Ph.D., Professor of Chemistry, University of Toronto, Toronto, Ont.

1939—Wickenden, R. T. D., Ph.B., M.A., Ph.D., 406 Customs Bldg., Calgary, Alta.

1957—Wiesner, K., D.Sc., Professor of Organic Chemistry, University of New Brunswick, Fredericton, N.B.

1926—Williams, M. Y., B.Sc., Ph.D., Professor Emeritus of Geology, University of British Columbia, Vancouver, B.C. (Past President)

1935—Williams, W. L. G., M.A., Ph.D., D.ès Sc., LL.D., 1635 Selkirk Ave., Montreal, P.Q.

1938—Wilson, Alice E., M.B.E., LL.D., Ph.D., 55 Park Ave., Ottawa, Ont.

1960—Wilson, H. D. B., B.Sc., M.S., Ph.D., Professor, Department of Geology, University of Manitoba, Winnipeg, Man.

1948—Wilson, J. Tuzo, O.B.E., B.A., Sc.D., Ph.D., LL.D., D.Sc., Professor of Geophysics, University of Toronto, Toronto, Ont.

1924—Wilson, M. E., Ph.D., 22 Monkland Ave., Ottawa, Ont.

1946—Winkler, C. A., O.B.E., M.Sc., Ph.D., D.Phil.(Oxon), Professor of Chemistry, McGill University, Montreal, P.Q.

1950—Woonton, G. A., M.A., D.Sc., MacDonald Professor and Chairman, Department of Physics, Director, Eaton Electronics Research Laboratory, McGill University, Montreal, P.Q.

1956—Wright, G. F., B.Sc., Ph.D., Professor, Department of Chemistry, University of Toronto, Toronto, Ont.

1954—Wright, K. O., M.A., Ph.D., David Dunlap Observatory, Richmond Hill, Ont.

1943—Wynne, A. M., M.A., Ph.D., 15 Bayview Ridge Crescent, Willowdale, Ont.

1940—Wynne-Edwards, V. C., M.A., Professor of Natural History, Marsichall College, University of Aberdeen, Aberdeen, Scotland

1957—Wu, Ta-You, M.A., Ph.D., Senior Research Officer and Head of Theoretical Physics Group, National Research Council, Ottawa, Ont.

1951—Wyman, Max, B.Sc., Ph.D., Associate Professor of Mathematics, University of Alberta, Edmonton, Alta.

1958—Yaffe, Leo, B.Sc., M.Sc., Ph.D., Associate Professor, Department of Chemistry, McGill University, Montreal, P.Q.

1935—Young, E. Gordon, M.Sc., Ph.D., D.Sc., Director of the Atlantic Regional Laboratory, National Research Council, Halifax, N.S.

1956—Zassenhaus, H. J., M.A., Ph.D., Department of Mathematics, University of Notre Dame, Notre Dame, Indiana, U.S.A.

CORRESPONDING MEMBERS

SECTION I

De Lacretelle, Jacques, de l'Académie française, Paris.

SECTION II

Siebert, Wilbur H., M.A., 182 West Tenth Ave., Columbus, Ohio, U.S.A.

SECTION III

WATTS, W. W., Imperial College of Science and Technology, London, England.

MEDAL AWARDS

MÉDAILLE PIERRE CHAUVEAU

(Founded 1952)

1952—PIERRE DAVIAULT
1953—B. K. SANDWELL, LL.D., D.C.L.
1954—GÉRARD MORISSET, B.A., LL.L.
1955—JEAN-MARIE GAUVREAU, D.Sc.Pol.
1956—VICTOR MORIN, B.A., LL.D., O.I.P., Ch. Grand'Croix de l'Ordre du Saint-Sépulcre de Jérusalem
1957—CLAUDE MELANÇON, D.ès S.
1959—HARRY BERNARD, B.A., L.ès L., D.ès L.
1960—F. C. A. JEANNERET, B.A., D.ès L., LL.D., O.A.
1961—GÉRARD MALCHELOSSE

FLAVELLE MEDAL

(Founded 1925)

1952—A. G. HUNTSMAN, M.D.
1953—E. G. D. MURRAY, O.B.E., M.A., L.M.S.S.A., M.D., D.Sc.
1954—D. A. SCOTT, M.A., Ph.D., F.R.S.
1955—C. S. HANES, Ph.D., Sc.D., F.R.S.
1956—GEORGE LYMAN DUFF, M.A., M.D., Ph.D.
1957—T. W. M. CAMERON, T.D., M.A., Ph.D., D.Sc., M.R.C.V.S.
1958—A. G. LOCHHEAD, M.Sc., Ph.D.
1959—MURRAY L. BARR, M.D., M.Sc.
1960—E. M. WALKER, M.B.
1961—C. P. LEBLOND, M.D., L. ès Sc., Ph.D., D.Sc.

HENRY MARSHALL TORY MEDAL

(Founded 1943)

1945—OTTO MAASS, C.B.E., M.Sc., Ph.D., LL.D., F.R.S.
1946—JOHN S. FOSTER, B.Sc., Ph.D., F.R.S.
1947—E. F. BURTON, O.B.E., Ph.D.
1949—H. S. M. COXETER, Ph.D., F.R.S.
1951—T. THORVALDSON, A.M., Ph.D., D.Sc., LL.D.
1953—G. HERZBERG, M.A., Dipl.Ing., Dr.Ing., F.R.S.
1955—E. W. R. STEACIE, O.B.E., M.Sc., Ph.D., D.Sc., LL.D., D. de l'U., F.R.S.
1957—C. S. BEALS, M.A., D.I.C., Ph.D., D.Sc., F.R.S.
1959—H. G. THODE, M.B.E., M.Sc., Ph.D., D.Sc., F.R.S.
1961—R. M. PETRIE, M.B.E., A.M., Ph.D.

LORNE PIERCE MEDAL

(Founded 1926)

1951—E. K. Brown, B.A., D. ès L. (posthumously)
1952—Hugh MacLennan, M.A., Ph.D.
1953—Earle Birney, Ph.D.
1954—Alain Grandbois
1955—William Bruce Hutchison
1956—Thomas H. Raddall, LL.D.
1957—A. M. Klein
1958—H. Northrop Frye, M.A., Ph.D.
1959—Philippe Panneton
1960—Morley Callaghan
1961—Robertson Davies, B.Litt., D.Litt., LL.D.

TYRRELL MEDAL

(Founded 1928)

1952—C. B. Sissons, LL.D.
1953—Séraphin Marion, M.A., D. ès L.
1954—G. de T. Glazebrook
1955—C. P. Stacey, O.B.E., A.M., Ph.D.
1956—Mgr Olivier Maurault, C.M.G., P.D., LL.D., p.SS., D. ès L., D.C.L.
1957—George F. G. Stanley, M.A., B.Litt., D.Phil.
1958—W. L. Morton, B. Litt., M.A.
1959—Mgr Arthur Maheux, O.B.E., M.A., L.ès L., D.Th.
1960—S. D. Clark, M.A., Ph.D.
1961—Guy Frégault, Ph.D.

WILLET G. MILLER MEDAL

(Founded 1943)

1945—Morley E. Wilson, Ph.D.
1947—F. H. McLearn, B.E., Ph.D.
1949—H. V. Ellsworth, M.A., Ph.D.
1951—J. E. Hawley, M.A., Ph.D.
1953—C. H. Stockwell, B.A.Sc., Ph.D.
1955—J. Tuzo Wilson, O.B.E., B.A., Sc.D., Ph.D. LL.D., D.Sc.
1957—J. E. Gill, B.Sc., Ph.D.
1959—L. S. Russell, B.Sc., M.A., Ph.D., LL.D.
1961—W. H. White, M.A.Sc., Ph.D.

THE HARRISON PRIZE AWARD

(Founded 1957)

1957—R. G. E. Murray, M.A., M.D., C.M., and C. F. Robinow, M.D.
1960—R. A. MacLeod

PRESIDENTS

1951-1952 . . . H. F. Angus, M.A., B.C.L., LL.D.
1952-1953 . . . G. B. Reed, O.B.E., M.A., B.Sc., Ph.D., LL.D.
1953-1954 . . . Jean Bruchési, LL.L., D.Sc.Pol., D. ès L.
1954-1955 . . . E. W. R. Steacie, O.B.E., Ph.D., D.Sc., F.R.S.
1955-1956 . . . G. S. Hume, O.B.E., Ph.D.
1956-1957 . . . W. A. Mackintosh, C.M.G., M.A., Ph.D., LL.D., D.C.L.
1957-1958 . . . T. W. M. Cameron, T.D., M.A., Ph.D., D.Sc., M.R.C.V.S.
1958-1959 . . . Pierre Daviault
1959-1960 . . . H. G. Thode, M.B.E., M.Sc., Ph.D., D.Sc., F.R.S.
1960-1961 . . . M. Y. Williams, B.Sc., Ph.D.
1961-1962 . . . A. R. M. Lower, M.A., Ph.D., LL.D.

LIST OF PRESIDENTS OF SECTIONS

SECTION I

1951-1952 . . . . . L'abbé Arthur Maheux
1952-1953 . . . . . Claude Melançon
1953-1954 . . . . . Gérard Morisset
1954-1955 . . . . . Jean Chauvin
1955-1956 . . . . . Eugène L'Heureux
1956-1957 . . . . . Jean-Marie Gauvreau
1957-1958 . . . . . Adrien Plouffe
1958-1959 . . . . . Maurice Lebel
1959-1960 . . . . . Léon Lortie
1960-1961 . . . . . Antoine Roy
1961-1962 . . . . . T. R. Père L.-M. Régis

SECTION II

1951-1952 . . . . . A. S. P. Woodhouse
1952-1953 . . . . . A. R. M. Lower
1953-1954 . . . . . F. M. Salter
1954-1955 . . . . . D. A. MacGibbon
1955-1956 . . . . . J. S. Thomson
1956-1957 . . . . . W. Kaye Lamb
1957-1958 . . . . . F. H. Underhill
1958-1959 . . . . . V. W. Bladen
1959-1960 . . . . . G. B. Phelan
1960-1961 . . . . . F. R. Scott
1961-1962 . . . . . G. E. Wilson

SECTION III

1961-1962 . . . . . G. de B. Robinson

ASSOCIATED ORGANIZATIONS

The Canadian Institute of Mining and Metallurgy

THE ROYAL SOCIETY OF CANADA

REPORT OF THE HONORARY SECRETARY FOR THE YEAR 1960-61

A. COUNCIL MEETINGS

The Council held three meetings during the year to conduct the affairs of the Society. The Report of Council presented to the Annual Meeting of the Royal Society of Canada contains a complete account of the year's business. The Executive Committee met twice to deal with current affairs.

The Sections recommended the election of twenty-seven Fellows. Their names, and the Sections to which they were elected, appear under "Annual Meeting."

Six medals were awarded by the Society:

Médaille Pierre Chauveau to M. Gérard Malchelosse
Flavelle Medal to Dr. C. P. Leblond, F.R.S.C.
Lorne Pierce Medal to Mr. Robertson Davies, F.R.S.C.
Tyrrell Medal to M. Guy Frégault
Henry Marshall Tory Medal to Dr. R. M. Petrie, F.R.S.C.
Willet G. Miller Medal to Dr. W. H. White

(Citations are given on pages 49–55)

Three Royal Society of Canada Scholarships were awarded for the academic year 1961–62, two of $3,000 each by the Royal Society of Canada Awards Committee to Dr. J. D. Ketchum, F.R.S.C., and Professor K. von Maltzahn; the other by a Committee of Section I to M. Paul Bussières.

Two Rutherford Memorial Fellowships of $750 each were also awarded, to supplement National Research Council post-doctoral Fellowships, to Dr. R. L. Armstrong and to Dr. D. R. Moorcroft.

The Awards Committee was again asked to receive and screen applications for the sixth series of Fellowships offered by NATO. The best candidates were selected by the Royal Society of Canada Awards Committee and forwarded to Paris, where the final selection was made by NATO's own Selection Committee.

At the request of the Embassy of the Federal Republic of Germany, the Committee also dealt with applications received for three Scholarships offered to Canadians by the West German Government, tenable in Germany for the academic year 1961–62.

The Sir Arthur Sims Fellowship Committee met and chose the recipient for 1961–62.

The Society now consists of three Sections—I. Humanités et sciences sociales; II. Humanities and Social Sciences; III. Science.

The Officers of the Society now are: A President, a first Vice-President, a second Vice-President, an Honorary Secretary, an Associate Honorary Secretary, an Honorary Treasurer, an Associate Honorary Treasurer, an Honorary Librarian, and an Honorary Editor.

There were two retirements: Dr. R. M. Anderson, Section V, and Dr. J. F. Wright, Section IV.

B. ANNUAL MEETING

The Annual Meeting was opened in the Auditorium, Physical Sciences Centre, McGill University, at 10.00 A.M., June 5. The following Fellows were present:

SECTION I

Audet, Louis-Philippe; Baudouin, L.-M.; Beaulieu, Marie-Louis; Béraud, Jean; Boissonnault, C.-M.; Bonenfant, J.-C.; Brouillette, Benoît; Chabot, Cécile; Dagenais, Pierre; Daviault, Pierre; Dion, l'abbé Gérard; Douville, Raymond; Dubé Marcel; Dufresne, Jean; Duhamel, Roger; Faribault, Marcel; Filiatrault, Jean; Gauvreau, Jean-Marie; Gélinas, Gratien; Guèvremont, Germaine; Lamontagne, Léopold; Lanctôt, Gustave (retired); Laurence, J.-M.; Laurendeau, André; Lebel, Maurice; Lefebvre, Jean-Jacques; Lockquell, frère Clément; Lortie, Léon; Maurault, Mgr Olivier; Melançon, Claude; Parizeau, Gérard; Plouffe, Adrien; Sylvestre, Guy; Thériault, Yves.

SECTION II

Angus, H. F.; Bagnani, G. F.; Bayley, C. C.; Bladen, V. W.; Brown, G. W.; Bryce, R. B.; Collin, W. E.; Daniells, Roy; Dobson, W. A. C. H.; Dorland, A. G. (retired); Easterbrook, W. T.; Elliott, G. A.; Ferguson, W. K.; Fieldhouse, H. N.; Goudge, T. A.; Hebb, D. O.; Helleiner, K. F.; Hemlow, Joyce; James, F. Cyril; Johnson, A. H.; Ketchum, J. D.; Keyfitz, Nathan; Kirkconnell, Watson; Klinck, C. F.; Long, M. H.; Lower, A. R. M.; MacDonald, V. C.; MacGillivray, J. R.; MacKenzie, N. A. M.; Mackintosh, W. A.; Masters, D. C.; McIlwraith, T. F.; Neatby, Hilda; Pacey, W. C. D.; Phelan, G. B.; Phelps, Arthur L.; Priestley, F. E. L.; Roe, F. G.; Rouillard, C. D.; Scott, F. R.; Scott, R. B. Y.; Simpson, G. W.; Sissons, C. B.; Smith, Wilfred Cantwell; Soward, F. H.; Stacey, Charles P.; Stanley, George F. G.; St. Clair-Sobell, James O.; Stewart, Andrew; Thomson, J. S.; Timlin, Mabel F.; Trethewey, W. H.; Wilson, G. E.

SECTION III

Adams, G. A.; Archibald, William J.; Babbitt, J. D.; Beals, C. S.; Bell, R. E.; Blaikie, K. G.; Burgess, R. E.; Cameron, Alastair; Carmichael,

Hugh; Currie, B. W.; Davies, F. T.; Demers, Pierre; Derry, Douglas; Duckworth, H. E.; Elliott, L. G.; Field, George S.; Forsyth, P. A.; Foster, J. S.; Fox, Charles; Gaudry, Roger; Hachey, H. B.; Halperin, I.; Heard, John F.; Herzberg, Gerhard; Hogg, Helen S.; Hurst, D. G.; Johns, Martin W.; Jones, R. N.; Katz, Leon; Laidler, K. J.; Laurence, G. C.; Maass, Otto; Macphail, M. S.; Manske, R. H. F.; Marion, Léo; Marshall, J. S.; McIntosh, R. L.; McKay, Arthur F.; McKinley, D. W. R.; McLay, A. B.; Mendelsohn, Nathan S.; Misener, A. D.; Munro, L. A.; Niven, C. D.; Pearson, W. B.; Petrie, R. M.; Preston, M. A.; Purves, C. B.; Risi, Joseph; Robinson, G. de B.; Rose, D. C.; Sargent, B. W.; Scherk, Peter; Schneider, W. G.; Shaw, A. Norman; Shrum, G. M.; Smith, H. Grayson; Spinks, J. W. T.; Thode, H. G.; Thomson, Andrew; Volkoff, G. M.; Westman, A. E. R.; Williams, W. L. G.; Winkler, C. A.; Woonton, G. A.

Section IV

Armstrong, H. S.; Baird, D. M.; Berry, L. G.; Bostock, H. S.; Byers, A. R.; Clark, T. H.; Denis, B. T.; Douglas, R. J. W.; Fortier, Y. O.; Garland, George D.; Gill, J. E.; Hacquebard, P. A.; Harrison, J. M.; Hawley, J. E.; Henderson, J. F.; Hodgson, John H.; Hurst, M. E.; James, W. F.; Jones, I. W.; Lang, A. H.; Langford, G. B.; Leech, G. B.; Lord, C. S.; Mawdsley, J. B.; MacKay, B. R. (retired); Moorhouse, W. W.; O'Neill, J. J.; Osborne, F. F.; Riddell, J. E.; Roliff, W. A.; Shaw, Denis M.; Sternberg, G. M.; Stevenson, J. S.; Tanton, T. L.; Thomson, J. E.; Warren, H. V.; Weeks, L. J.; Williams, M. Y.; Wilson, H. D. B.

Section V

Altschul, Rudolf; Bailey, D. L.; Bélanger, L.-F.; Bernard, Richard; Bishop, C. J.; Brown, A. W. A.; Browne, J. S. L.; Burton, A. C.; Cameron, T. W. M.; Campbell, J. J. R.; Cantero, Antonio; Collip, J. B.; Cook, W. H.; Cormack, R. G. H.; Craigie, E. Horne; Daviault, Lionel; Dugal, L.-Paul; Dunbar, M. J.; Eagles, Blythe; Fallis, A. Murray; Fisher, K. C.; Foerster, R. E.; Gibbs, R. Darnley; Gibbons, N. E.; Gorham, Paul R.; Goulden, C. H.; Grace, N. H.; Groves, J. W.; Hall, G. E.; Hayes, F. R.; Hopkins, J. W.; Huntsman, A. G.; Krotkov, G.; Leblond, C. P.; Lochhead, A. G.; Lucas, C. C.; Mitchell, C. A.; Morgan, J. F.; Murray, E. G. D.; Neish, Arthur C.; Noble, R. L.; Panisset, M. G.; Pomerleau, René; Porsild, A. E.; Préfontaine, Georges; Quastel, J. H.; Raymond, Marcel; Robinow, C. F.; Rose, Bram; Scott, D. A. (retired); Simard, L. C.; Thompson, I. M.; Thomson, D. L.; Tremblay, J.-L.; Young, E. Gordon.

(a) First General Meeting

The first general meeting was called to order by the President, Dr. M. Y. Williams, who welcomed the Fellows and their guests and expressed the gratitude of the Society to McGill University for its generosity in playing

host to the Society. Dr. F. Cyril James, Principal of McGill University welcomed the Fellows in the following words:

It would, at any time, be a pleasure to welcome the Royal Society of Canada to McGill University, but it is particularly pleasant to do so when three of the five Section Presidents are McGill colleagues. Those three are already at home in these buildings, and I hope that all of the Fellows of the Society will very quickly find themselves equally at home and comfortable.

As many of you know, the three universities that are situated in Montreal are trying to work out an experiment in which you—distinguished ladies and gentlemen—are the guinea pigs. The Learned Societies of Canada have increased so greatly in number and in membership during the past ten or fifteen years that very few of the universities of Canada have the facilities to accommodate them all. Either the several societies must meet in different parts of the country or a group of universities must collaborate as hosts.

The advantages of convening all of the Learned Societies, in sequence, in a single area are apparent to those of us—and they are many—who are members of more than one of them. The University of Montreal, Sir George Williams University, and McGill are, therefore, acting as joint hosts to this series of meetings. The credit for the detailed arrangements goes chiefly to Messieurs George Grimson, André Bachand, and Gault Finley, who are the senior members of the co-ordinating committee, and I hope that you will find those arrangements convenient in every way.

Indeed, in welcoming you this morning, I should like to hope that this 1961 experiment will prove so successful that it will become a precedent so that each of the universities of Canada—large and small, old and new—may in turn enjoy the intellectual stimulus of having the Fellows of the Royal Society of Canada as guests on its campus.

May I add one further thought? This group of interconnected buildings in which most of your meetings will be held stretches from the McConnell Engineering Building, where you registered—the newest building on the McGill campus—to the Macdonald Physics Building in which Ernest Rutherford carried out his pioneering experiments in the field of atomic energy half a century ago. It is a mixture of old and new, a blending of tradition and new discovery—which is the ethos of the Royal Society itself. I hope that the amosphere may be conducive to a fruitful series of meetings, and that the Fellows of the Royal Society will be not be seduced *en masse* by the Third International Congress of Psychiatry which will also be in session here throughout the week.

The President thanked Dr. James and stated that the Society had enjoyed the hospitality of McGill University many times. A motion to approve the Minutes of last year's meeting was called. It was moved by M. Guy Sylvestre, seconded by Dr. D. L. Thomson, that the Minutes be taken as read and approved as circulated. CARRIED.

The Honorary Secretary presented the Report of Council and moved, seconded by Dr. F. Cyril James, that it be referred to the Sections for approval. CARRIED.

Dr. George F. G. Stanley, in the absence of Dr. A. R. M. Lower, introduced the following motion by Dr. Lower which had been circulated to the Fellows of the Society more than two months before the annual meeting:

Whereas the affairs of the Society are complex and require considerable

knowledge on the part of its officers for their administration; and whereas our constitution provides for yearly tenure of office by the President and the Vice-President, and whereas greater continuity of administration could be obtained by securing to these officers a longer term on the executive of the Society and on its Council, therefore,

Section 6, clause (1) is hereby amended as follows: Before the words "Vice-President" there shall be inserted the word "First." After the present words "a Vice-President," there shall be inserted the words "a Second Vice-President," making the words of the clauses read "a First Vice-President," "a Second Vice-President." Section 6, clause (2) shall be amended as follows: "The President, or, in the event of his being unable to do so, the First Vice-President, or, in the event of his being unable to do so, the Second Vice-President. . . ."

The amendment, explained Dr. Stanley, is designed to meet the difficulty of the principal officers of the Society having to master much administrative detail in a short time. If a Second Vice-President were added, under the conventional rules of succession, that is from second to first and thence to President, the nominee would have three years instead of two with which to familiarize himself with the detail of administration. If these officers reside at various points in the country, the chances of one or more of them being at the ordinary meetings of committees would thereby be enhanced. The Second Vice-President, when his term for presidential office came around, should under these conditions have a good grasp of the various details of the Society's business, which may be expected to become more complex and voluminous as the years go by.

It was moved by Dr. A. R. M. Lower, seconded by M. Marcel Faribault, that the motion be approved. CARRIED.

Dr. N. E. Gibbons presented a similar motion (which also had been circulated to the Fellows of the Society more than two months before this annual meeting): That an Associate Honorary Treasurer be appointed to assist the Honorary Treasurer in his duties and to act for him in his absence. It was moved by Dr. N. E. Gibbons, seconded by Dr. J. D. Babbitt that the motion be approved. CARRIED.

Col. C. P. Stacey stated that these motions increase the membership of Council, which is already too large, and although there are strong arguments for these motions, he hoped that the membership of Council could be reduced at a later meeting.

The meeting was adjourned at 10.50 A.M.

(b) Annual Dinner

At the dinner offered by McGill University on Monday evening, June 5, Dr. F. Cyril James addressed the Society as follows:

It would be inappropriate for me to repeat the things I said at the opening session this morning, but I do want, most warmly, to reiterate my welcome to McGill University.

Sixty years have passed since this Royal Society of Canada was first conceived within the geographical limits of this Province of Quebec, where we are now meeting, and much of the work of organization was carried out by Dr. J. W.

Dawson (as he then was) in the study that I still use as an office in Dawson Hall. If you will permit me, I should like to read you a couple of paragraphs from Sir William Dawson's autobiography that describe the germination of the idea that is tonight so splendidly embodied in this gathering.

"In the summer of 1881 the Governor General of Canada, the Marquis of Lorne, invited me to visit him in his apartments in the citadel of Quebec with the object of consulting me in regard to a project for the organization of a society to be called The Royal Society of Canada. The idea was new to me and evidently involved serious difficulties besides no small labour on the part of those who might be entrusted with the arrangement of the details. I felt confident however that under the patronage of Lord Lorne it would be successful and that the scientific side at least of the proposed society would be strong from the first. Personally I would have preferred to have had to do with a society devoted to Natural Science resembling in its plan the Royal Society of London, but Lord Lorne was desirous of making the basis of the society as comprehensive as possible, and especially of enlisting the French Canadian element, which, though rich in cultivators of Literature and History had given little attention to Natural and Physical Society. Local reasons also weighted in favour of giving it a popular and democratic character. . . . My own wide acquaintance with scientific and educational men in different parts of Canada seemed to give me exceptional facilities for at least the preliminary work and I undertook at the request of His Excellency to preside over the first meeting of the society, stipulating however that my friend Dr. Chauveau should be associated with me as vice-president as a representative of literature and of the educated element in French Canada. Names were suggested of men to form a provisional council and Dr. (now Sir John) Bourinot was invited to be honorary secretary. . . . The society was launched in Ottawa in May 1882. The labour devolving on myself . . . was very great . . . more than compensated for however by witnessing the gathering of scientific and literary men at the first meeting, most of them known to me personally but many previously unknown to each other. . . ."

Next summer the Royal Society will celebrate the sixtieth anniversary of its first formal meeting—in the Railway Committee Room of the House of Commons in Ottawa—but tonight, as we are met in this Hall that Peter Redpath gave to McGill in response to Dawson's pleas, there are two thoughts out of the past that are worth recalling.

In his discussions with the Marquis of Lorne, Dawson emphasized, with the fervour that made his work anathema to Samuel Butler, the importance of science and technology to the development of Canada. He reiterated the theme in his Presidential Address to the Society in 1882. "The most insignificant natural agencies may sometimes attain to national importance. A locust, a midge or a parasitic fungus may suddenly reduce to naught the calculations of a finance minister."

How wise he was. We know today that atomic fission or the latest discoveries in biological warfare can bring to naught the hopes, and even the existence, of the whole nation.

But if Dawson, with his enthusiasm for science, was one of the parents of the Royal Society, the Marquis of Lorne was indubitably the other. How right he was to insist that the Society should include among its Fellows both French Canadians and English Canadians—so that it could become a great unifying force in the intellectual life of Canada. Perhaps he was even wiser in his insistence that the Royal Society of Canada should include Literature, History and Philosophy—which the parent Society of London has allowed to wither away from its activities. In spite of all the splendid progress of science in our own

generation science can only confront mankind with the alternative potentials of human development or human destruction. It is in the minds and hearts of men that the alternative will be decided.

Sir William Dawson was convinced that the Redpath Museum of Natural Science across the road, was more important to the development of higher education in Canada than the Redpath Library, of which this hall was originally a part. I do not think that Peter Redpath was fully convinced. He spent the later years of his life collecting books and studying political movements in England, so that perhaps it is not heresy in this atmosphere to say that Sections I and II over the years have justified the Marquis of Lorne's predictions. It may well be, in the years ahead, that Canada has even more to contribute to the world in the realm of human ideals and human relationships than in those fields of the natural sciences in which the Fellows of this Society have already contributed so much.

The President, Dr. M. Y. Williams, thanked the host and then asked the presidents of sections to introduce the twenty-seven new Fellows: Pierre Dagenais, M. l'abbé Gérard Dion, Jean Filiatrault, Mme Germaine Guèvremont, André Laurendeau (Section I); C. C. Bayley, R. B. Bryce, W. A. C. H. Dobson, C. F. Klinck, J. St. Clair-Sobell, W. C. Smith (Section II); R. E. Burgess, A. G. W. Cameron, C. Fox, A. F. McKay, M. A. Preston, A. E. R. Westman (Section III); R. B. Ferguson, P. A. Hacquebard, D. M. Shaw, C. R. Stelck (Section IV); R. Altschul, A. W. A. Brown, J. J. R. Campbell, Paul R. Gorham, J. F. Morgan, and Bram Rose (Section V).

The following citations were read by the Presidents of the Sections:

Section I

Pierre Dagenais, né à Montréal en 1909, est le directeur-fondateur de l'Institut de Géographie de l'Université de Montréal. Il fit ses humanités au Collège Sainte-Marie de Montréal et ses études de spécialisation à l'Ecole des Hautes Etudes commerciales dont il obtint la licence en Sciences commerciales, à l'Université de Paris où il décrocha une licence ès lettres et à l'Université de Grenoble où il se mérita le doctorat. Depuis plus de vingt ans, le Dr Dagenais a fait preuve d'une activité et d'un dynamisme remarquables : avant d'assumer la direction de l'Institut de Géographie, il fut professeur à l'Ecole normale Jacques-Cartier et à l'Ecole des Hautes Etudes commerciales; il fut également professeur invité à l'Université de British Columbia; il fait partie du Conseil de la Faculté des Lettres de l'Université de Montréal, il est Fellow de l'Arctic Institute of North America et membre de la Société des Ecrivains canadiens. Mais ce sont particulièrement les ouvrages du Dr Dagenais et leur rayonnement dans le champ de ses activités professionnelles qui ont attiré l'attention de ses collègues de la Société royale : il a publié, en effet, *Le Bugey savoyard*, en 1939, *Mélanges géographiques* en 1942, *Travelers' Guides for Canada*; signalons enfin l'une des œuvres les plus remarquables et les plus utiles du Dr Dagenais, la pré-

paration de manuels pour l'enseignement de la géographie au cours élémentaire et au cours secondaire. Il collabore également à la préparation de plusieurs livres et sa bibliographie compte près de trois cent titres. Nous sommes heureux de l'accueillir dans la section des Humanités et des Sciences sociales.

L'abbé Gérard Dion, né à Sainte-Cécile de Frontenac en 1912, est directeur du département des Relations Industrielles à la Faculté des Sciences sociales de l'Université Laval à Québec. C'est un universitaire de marque dans le domaine des relations du travail. Licencié en théologie et en philosophie, il possède aussi un maîtrise en sciences sociales : c'est à l'Université Queen's de Kingston qu'il s'est spécialisé en relations industrielles. Directeur du département des relations industrielles de la Faculté des Sciences sociales de l'université Laval depuis 1957, il a largement contribuée, par ses travaux originaux, par la publication de la revue *Relations industrielles* (qu'il dirige depuis 14 ans) et par l'édition des quinze ouvrages que comprend la collection *Congrès des relations industrielles*, il a largement contribué, dis-je, à créer la littérature existant dans ce domaine si important. Il a joué un rôle particulier dans la formation et l'orientation sociales du clergé canadien par son enseignement et par la publication de la revue désormais célèbre *Ad usum sacerdotum* — ou perspectives sociales qu'il a fondées et qu'il dirige depuis quinze ans. Il est l'auteur de plus de cent articles, de revues et de plus de vingt ouvrages et brochures qui sont parus depuis 1943. Les deux dernières publications « Le Chrétien et les elections » et « Le Catholique dans la démocratie » que l'abbé Dion a signé avec son confrère l'abbé Louis O'Neil, aux Editions de l'Homme ont connu une vogue considérable au cours des derniers mois. M. l'abbé Gérard Dion est un universitaire de marque dans le domaine des relations du travail et il représentera dignement cette discipline dans la section française de la Société Royale du Canada.

Jean Filiatrault, né à Montréal en 1920 est présentement le directeur des services français de l'agence de publicité Vickers & Benson Limitée. En 1959, M. Filiatrault bénéficiait d'une bourse de la Rockefeller Foundation. Bien qu'encore relativement jeune il a déjà une œuvre importante à son crédit : en 1953 il publiait un roman *Terres stériles* qui lui valut, l'année suivante, l'un des prix littéraires, aux concours de la province le Québec. Dans le même domaine, il publiait, en 1957, *Le Refuge impossible* et, en 1961, *L'Argent est odeur de nuit*; ajoutons-y un recueil de nouvelles intitulé *Chaînes* qui valut à son auteur d'être proclamé, en 1955, lauréat du Cercle du Livre de France. En 1954, M. Filiatrault obtenait un succès considérable avec sa pièce *Le Roi David* qui lui mérita le trophée Arthur Wood, le trophée Calvert régional et le trophée Calvert national accordé à la meilleure production au Festival d'Art dramatique. Signalons enfin *Les Mains vides*, adaptation romancée d'un scénario publié en 1954 aux Editions Fides. A cette énumération déjà impressionnante, il faut ajouter deux théâtres radiophoniques, *La Réussite* et *La Succession Dupont-Durant* qui atteste de l'intéressante variété des talents de M. Jean Filiatrault : il est un auteur

plein de promesses qui fera sûrement grand honneur à la Société Royale du Canada.

Germaine Guèvremont, née à St-Jérôme dans le comté de Terrebonne, est une journaliste et une romancière qui a connu, depuis une quinzaine d'années, un succès considérable dans les lettres canadiennes. Madame Guèvremont fut attachée au *Courrier de Sorel*, plus tard, chef du Secrétariat de la Société des Ecrivains canadiens. Les principales œuvres de Madame Guèvremont sont *Le Survenant* qui lui mérita le prix Duvernay en 1945, le premier prix de littérature de la Province de Québec en 1946 et le prix Olivier De Serres, à Paris, le premier à être donnée hors de France. D'autre part l'ouvrage *Le Survenant* fut le quatrième livre à être publié chez Plon à Paris dans la collection *l'Epi*, en compagnie des œuvres de Julien Green, Simone Weill, Gustave Thibon, et Jacques Madaule. En 1947, Madame Guèvremont publiait *Marie Didace* qui lui valut la médaille de l'Académie canadienne-française. *The Outlander* (traduction du *Survenant* et de *Marie Didace*) mérita à son auteur le prix du Gouverneur Général du Canada; de même *Monk's Reach*, traduction anglaise du *Survenant* et de *Marie Didace* était publié à Londres. Madame Guèvremont se classe d'emblée parmi les auteurs qui ont connu les plus grands succès à la télévision canadienne. Tous les téléspectateurs se rappellent encore avec émotion les programmes *Le Survenant* et *Au Chenal du Moine* dont on regrette encore la disparition. En 1952 Madame Guèvremont recevait un doctorat honorifique de l'Université Laval; elle est membre de la Société des Ecrivains canadiens, de la Canadian Authors' Association, de la Société des Auteurs dramatiques, du P.E.N. Club, et de l'Académie canadienne-française.

André Laurendeau, né à Montréal à 1912, est rédacteur en chef au journal *Le Devoir*. Après de solides études au Collège Sainte-Marie, puis à l'Université de Montréal, il suivit également des cours à l'Institut catholique et à la Sorbonne, de Paris. Il fut bientôt attiré par le journalisme et la politique. Sur le plan politique, rappelons qu'il fut député du Bloc populaire pour Montréal-Laurier à l'Assemblée Législative de Québec, de 1944 à 1948. Sur le plan du journalisme, André Laurendeau a connu jusqu'ici des succès remarquables : il fut directeur de la revue *l'Action nationale*, puis rédacteur en chef adjoint au journal *Le Devoir*, de 1948 à 1957, puis rédacteur en chef. Depuis 1953, M. Laurendeau connaît des succès enviables comme animateur du programme télévisé *Pays et merveilles*. Parmi les ouvrages qu'il a publiés, mentionnons : *Notre Nationalisme* (1925), *L'Abbé Lionel Groulx* (1938), *Actualités de Saint-François* (1938), *Alerte aux Canadiens-français* (1941), *Nos Ecoles enseignent-elles la haine de l'Anglais* (1942), *Voyages au pays de l'enfance* (1959), *Deux Femmes terribles* (théâtre 1960) et *La Vertu des chattes* qui doit paraître bientôt. André Laurendeau est un journaliste de grand talent : ses articles sur l'éducation ou la politique sont toujours remarquables. On peut ne pas partager les idées de leur auteur, mais on est forcé de lui reconnaître une grande probité intellectuelle, un talent incontestable pour synthétiser des situations

complexes, un style vif et percutant et un optimisme serein. C'est avec beaucoup de dignité qu'il représentera parmi nous l'excellente et redoutable fonction du journaliste.

Section II

Charles Calvert Bayley is Associate Professor of History in McGill University. Following his education at the universities of Manchester, England, and Marburg, Germany, he came to Canada as a lecturer in mediaeval history at the University of Toronto in 1931. Since that time he has held appointments at Colorado College, the University of Chicago, and at McGill. It is an academic truism that the teacher is always the better teacher for engaging in research. And Dr. Bayley has made himself one of Canada's leading scholars in mediaeval history. His *Formation of the German College of Electors in the 13th Century* is recognized as the authoritative work in its field; it won the Province of Quebec Prize in open literary competition in 1950. But Dr. Bayley, in working as a mediaevalist, has not neglected more modern times in his studies, as students both in the United States and in Canada well know. *This Age of Conflict: 1914 to the Present*, first published in 1943 is now in its third edition. As a scholar and as a teacher Dr. Bayley well deserves the honour of a fellowship in this Society.

Following brilliant academic careers at Toronto, Cambridge, and Harvard, and a short period in business, *Robert Broughton Bryce* joined the public service in 1938. In less than ten years he had become Assistant Deputy Minister of Finance, the Secretary of Treasury Board and the first Canadian Executive Director of the International Bank for Reconstruction and Development. In 1954 he was appointed Clerk of the Privy Council and Secretary to the Cabinet. As a student at Cambridge he studied under John Maynard Keynes, and he is still remembered by the senior staff at Harvard as the man who introduced Keynesian economics to that centre of learning a year before the "General Theory" was published. During the past twenty-five years Mr. Bryce has contributed more than a score of papers to learned and professional publications, but his membership in the Public Service has meant that many of his most important contributions to thought, theory, and practice in economics and political science have not appeared under his own name. He is both a distinguished scholar and an outstanding administrator.

William Arthur Charles Harvey Dobson is Professor of Chinese and Chairman of the Department of East Asiastic Studies in the University of Toronto. His early academic studies in Chinese were interrupted by war, but his experiences in that war, when he served with great distinction under Wavell, Auchinleck, Mountbatten, and Carton de Wiart, continued his preparation for an academic career in Chinese. After demobilization he went to Christ Church, Oxford; he graduated in 1946 and became a University Lecturer. He was appointed Professor in the University of Toronto in 1952.

His book, *Late Archaic Chinese,* has been recognized as a scholarly achievement of the first magnitude by his colleagues in the western world, and by his colleagues in China and Russia. A second book, *Early Archaic Chinese,* is in the press. Professor Dobson rejected the view that the Chinese language had no grammar; he used the theory of groups (as in mathematics) to work out the distribution of word-groups so that students could predict exactly where they would fall. Professor Dobson is not primarily, however, a grammarian. He is a humanist who sees the promise of a second renaissance for the West through the impact of the study of Asian cultures.

Carl F. Klinck, Professor of Canadian Literature at the University of Western Ontario, is widely known and highly regarded as a scholar in the field of literary history. Although he has concentrated on the pre-Confederation period of Canadian literature, Professor Klinck has devoted himself to a careful consideration of all aspects of Canadian literature. He has examined the relations of Canadian literature with other aspects of our national culture. Professor Klinck has contributed greatly to the understanding and appreciation of Wilfred Campbell, E. J. Pratt, and William Dunlop. He has edited many significant documents in the field of early Canadian literature. Carl Klinck has demonstrated impressive talents as participant in and director of comprehensive, co-operative, research projects. He is co-editor of an anthology of Canada, poetry and prose; General Editor of a literary history of Canada, and co-editor of a dictionary of Canadian authors. In his university he is admired as an inspiring teacher and as an amiable colleague.

Born in London, England, *James St. Clair-Sobell* did his undergraduate work in the University of Melbourne and pursued post-graduate studies at Genoa and Cambridge. He served in the Royal Air Force from 1938 to 1945, attaining the rank of Wing Commander. In 1946 he received his doctoral degree from the University of Graz and in the same year was invited to the University of British Columbia to organize a department of Slavonic Studies, of which he has since been the head. He is the author of numerous critical studies in the field of linguistics and slavonics and was last year elected Canadian representative to the Council of the International Association of Slavonic Languages and Literature. Section II is pleased to honour both Dr. St. Clair-Sobell and the discipline in which he is a distinguished figure.

Wilfred Cantwell Smith is Birks' Professor of Comparative Religion and Director of the Institute of Islamic Studies at McGill University. Born in Toronto, Dr. Smith studied in his native city, and also in Grenoble, Madrid, Cairo, Cambridge, and Princeton, thus acquiring a wide experience of other cultures and a considerable interest in the Muslim world. This interest was confirmed and expanded by his years of teaching at Lahore, in what is now the state of Pakistan. In 1949 he accepted his present appointment at McGill. Professor Smith is the author of numerous articles and pamphlets on comparative religion and on current Islamic affairs and history. He is the

author of two books, *Modern Islam in India*, and *Islam in Modern History*, both of which have given him an international reputation as a scholar and have brought lustre to his university. Some of this lustre must now be shared with the Royal Society of Canada, which is pleased to include him as a distinguished member of its fellowship.

Section III

Ronald Eric Burgess, Professor of Physics at the University of British Columbia, is a leading authority in the field of physical electronics, both experimental and theoretical. A native of England and graduate of the University of London, before he joined the Staff of the University of British Columbia in 1954 he was Principal Scientific Officer at the Radio Research Station, Slough. A prodigious research worker, he is the author of over sixty papers on special fields such as antenna theory, wave propagation, transistors, and statistical theory of noise. His inspiring leadership of graduate students is also making a notable contribution to his university. He is the American Editor of the annual review *Progress in Semi-conductors*.

Alastair Graham Walter Cameron, Senior Research Officer, Physics Division, Atomic Energy of Canada Limited, Chalk River, is a world leader in the field of nuclear reactions at high temperatures and densities. A graduate of the University of Manitoba, with a doctor's degree from the University of Saskatchewan in 1952, he has recently been Visiting Professor of Physics at the California Institute of Technology. His work has led to a better understanding of the nuclear energy processes in stars, of the abundances of different elements in stars, and of the occurrence of stellar nova explosions at high densities and temperatures. Dr. Cameron's sound knowledge of nuclear physics, his bold imagination, and incisive mind have led him to make a remarkable contribution to nuclear astrophysics.

Charles Fox, Professor of Mathematics at McGill University, has made a substantial contribution to the general theory of integral transforms. A graduate of Cambridge University with first class honours in Parts I and II in the mathematical tripos, he later received a D.Sc. from the University of London. During World War I he served with the British Expeditionary Force in France, and during World War II he worked on aircraft research on predictors and radar. After twenty-eight years on the staff of Birkbeck College, University of London, he came to McGill University in 1949. His publications, which invariably show an imaginative spark, include a textbook on the calculus of variations, and more than thirty research papers. An outstanding scholar and teacher, he has steadily maintained his research since he wrote his first paper in 1925.

Arthur Ferguson McKay, Vice-President, Research and Development, Monsanto Canada Limited, is an outstanding organic chemist. For his prolific work in the field of organic nitrogen derivatives he has won international recognition. A native of Nova Scotia, with degrees from McGill, Dalhousie,

and Toronto, he held appointments at Queen's University and the Defence Research Board before becoming Director of Research and Development for Monsanto in 1954. He has done remarkable work in the field of steroids, the stereochemistry of fatty acids, amino acids, explosives, and physiologically active substances. The more than one hundred papers he has published, and the ten patents he has acquired, are eloquent testimonials to his successful work.

Melvin Alexander Preston, Professor of Physics, McMaster University, is a nuclear theoretical physicist with an international reputation. A graduate from the honour Mathematics and Physics course of the University of Toronto, with a master's degree later in applied mathematics, he received his Ph.D. in mathematical physics from the University of Birmingham in 1949. During World War II he served as Captain in the Royal Canadian Artillery and Technical Staff Officer in the Directorate of Artillery. Until 1953 he was on the staff of the University of Toronto and Visiting Professor at Chalk River in the summers. Since 1953 he has been on the staff of McMaster. He is well known for his extension of the theory of alpha-decay, review work on beta-decay and its nature, and work on nucleon forces with repulsive cores.

Albert Ernest Roberts Westman, Director of Research, Ontario Research Foundation, is known for many contributions in the fields of ceramics, statistics, and physical chemistry of the phosphates. A native of Ottawa, with degrees, including the Ph.D., from the University of Toronto, before joining the staff of the Ontario Research Foundation in 1929 he was on the staff of the University of Illinois and of Rutgers University. During the war he participated in the development and operation of a large analytical and testing programme at the Ontario Research Foundation for the Inspection Board of the United Kingdom and Canada. In 1954 he received the Frank A. Forrest award of the American Ceramics Society for his work in the field of phosphate soluble glasses.

Section IV

Robert Bury Ferguson, Professor of Geology at the University of Manitoba, was born in Galt, Ontario, and received his education there and at the University of Toronto. He joined the staff of the University of Manitoba in 1947, and except for a year as a post-doctoral fellow at Cambridge, has been there ever since. He started as a general geologist with experience on field parties in his student days but gradually shifted to mineralogy. His researches have been on a variety of mineralogical problems such as red gold, titanium compounds, the morphology of muscovite, and the crystallography of synthetic YTa04. More recently, he has become widely known for his work on feldspars.

Peter Albertus Hacquebard. The glorious colours of Ottawa's springtime tulips and a man interested in internals of coal seams appear to have little in

common. Yet among the postwar transplants from the Netherlands in that city, one of the most successful has been Peter Albertus Hacquebard, born in Rotterdam and educated at the University of Leiden. After a brief flirtation with the oil industry, he joined the Geological Survey of Canada in 1948 and was put in charge of the newly formed Coal Research laboratory at Sydney, Nova Scotia. Since then he has poured out a steady stream of contributions of high scientific merit. His researches in palynology led to the first recognition of coal of Carboniferous age in western Canada. He has made outstanding contributions to the revision of the nomenclature and classification of coal and in the field of coal petrography. His work on age determination and correlation of coal seams by petrographic and spore analysis, the mechanism and causes of spontaneous combustion in coal, and his contribution to the understanding of stress relief "bumps" in coal mines have earned him an international reputation. He is now Head of the Coal Research Section, Fuels and Stratigraphy Division, Geological Survey of Canada.

The career of *Denis Martin Shaw* started in Lancashire and has led through an English lower school education and Cambridge University, followed by service in the Royal Air Force, graduate work and a doctorate at the University of Chicago, to an associate professorship at McMaster University. His researches have largely been an application of chemistry to geological materials and problems. That he has wondered a little about his field is perhaps indicated in the title of one of his papers, "The Nature and Some Results of Geochemistry." His special interest has been the behaviour in geological environments of certain rare elements, thallium, indium, gallium, lithium, and barium, and what happens to trace elements in rocks that have undergone progressive metamorphism. He has turned his attention to radioactive mineral deposits and throughout his bibliography a concern with techniques of spectrochemistry is evident. To provide some comfort for classical geologists, he has included the areal geology of part of Calumet Island. In academic circles, Dr. Shaw has proved his ability as a successful teacher and administrator.

Charles Richard Stelck, Professor of Geology at the University of Alberta, has made outstanding scientific contributions in palaeontology, stratigraphy, palaeogeography, and petroleum geology. His world is the North America of late Palaeozoic and Mesozoic times and his researches into what it was like in those times have ranged from detailed descriptions of micro-organisms of the day to the distribution of the ancient lands and seas. He is a recognized authority on the fauna and flora of Cretaceous rocks and his publications on the palaeogeography of western Canada are classics in their field. In practical terms his work has greatly assisted in the development of petroleum resources in northern British Columbia and the Fort St. John gas field. His students in the University of Alberta have contributed widely and successfully in the petroleum industry and in research institutions.

Section V

Rudolf A. Altschul, M.U. Dr. (M.D.), was born in Prague, trained in Medicine at the German University in Prague, with post-graduate training in Paris and in Rome. He spent ten years in the Histology Department of the German University in Prague and in part-time practice in neurology and psychiatry. In 1939 he joined the University of Saskatchewan where he is now Professor and Head of the Department of Anatomy. Dr. Altschul is an authority in histology and neuroanatomy. His studies have dealt with clinical neurology, with normal and pathological histology of the nervous system, of skeletal muscle, and, especially, of blood vessels. His studies of arteriosclerosis have gained him international fame. He was elected Fellow of the Gerontological Society. His publications include eighty papers and two books, one on arteriosclerosis (Thomas, 1950) and one on endothelium (Macmillan, 1954).

A. W. A. Brown, M.B.E., B.Sc.F., M.A., Ph.D., has given leadership, with sound scholarship and originality in research, in the field of Entomology, not only to Canada but internationally. He has had remarkably wide interests and training, obtaining degrees in Forestry, Zoology, and Biochemistry. His numerous papers and books on Insect Physiology, Biochemistry, and chemical control of pests are internationally recognized as authoritative. He has served as expert consultant, not only in Canada but for Britain, the United States, and the World Health Organization. Dr. Brown has contributed greatly as Head of the Zoology Department of the University of Western Ontario, as editor of many journals, and as an officer in scientific societies.

Jack James Ramsey Campbell, Professor of Dairying, Faculty of Agriculture, University of British Columbia, has made an outstanding contribution to research in the field of intermediate microbial metabolism. He has published widely and as a result of the work he has done, he has on two occasions been invited to serve as Visiting Professor at the Graduate Schools of Johns Hopkins University and of the University of Illinois. He has achieved an enviable reputation as a teacher, both at the undergraduate and at the graduate level. He is at present one of the Associate Editors of the *Canadian Journal of Microbiology* and has served for the American Society of Bacteriologists as Associate Editor of *Bacteriological Reviews*. He was President of the Physiology Section, American Society of Bacteriologists during the period 1955–56.

Paul R. Gorham, B.Sc. (New Brunswick), M.Sc. (Maine), and Ph.D. (California Institute of Technology, 1943), joined the staff of the National Research Council in 1945. His research has included various aspects of plant physiology and photosynthesis and he has recently made substantial contributions to our knowledge of toxicity in the blue-green algae, and translocation in higher plants. Dr. Gorham is largely responsible for the success of

the annual Plant Physiology Conferences (1954–58) and he has been elected first President of the newly formed Canadian Society of Plant Physiologists. He is also Vice-Chairman of the General Programme Committee for the IX International Botanical Congress.

Joseph Francis Morgan, Chief, Biochemical Research Section, Laboratory of Hygiene, Department of National Health and Welfare. His major field of interest has been the application of biochemistry to the study of living cells in tissue culture. This work was begun in 1947 in the laboratory of Dr. R. C. Parker at the Connaught Laboratories as an attempt to develop a chemically-defined medium for the propagation of animal tissues *in vitro*. From these studies, synthetic medium 199 was developed and was subsequently employed for the development of the poliomyelitis vaccine. Studies have been extended to the determination of metabolic pathways in the nutrition of tissue cultures with the objective of determining whether detectable differences exist in the metabolism of normal and malignant cells. Some indications of specific differences have been obtained. As a logical extension of this work, the specificity of ascitic tumour cells has been studied and detailed investigations on the isolation and mode of action of anti-tumour agents carried out. Dr. Morgan has recently been honoured by the Chemical Institute of Canada through the awarding of the Merck Lecture Award for 1959.

Bram Rose, Associate Professor of Medicine, McGill University, in early work on the metabolism of histamine brought forward a number of new facts regarding the behaviour of this substance in the various tissues of the body. His demonstration of the effect of adrenalectomy on histaminase in the kidney was one of the first demonstrations of the effect of the removal of an endocrine gland on the enzyme content of a tissue. His demonstration of the effect of cortisone and ACTH on asthma and other allergic disorders was an important original contribution on the effect of these agents in diseases of hypersensitivity. His major over-all contribution has been the constant introduction of new techniques, physiological, biochemical, and physical-chemical, in the study of the diseases of hypersensitivity and he has been the major contributor in Canada in developing and applying new techniques from a variety of fields to the study of hypersensitivity and thereby bringing out a number of new facts and developing new concepts in the field.

Those present were formally presented to the President of the Society by the Presidents of the Sections, received their diplomas, and signed the Charter Book. M. Marie Louis Beaulieu (Section I), elected in 1958; Mr. Justice V. C. MacDonald and Dr. F. G. Roe (Section II), elected in 1960; W. B. Pearson (Section III), elected in 1960; G. B. Leech (Section IV), elected in 1960; R. F. Farquharson, and A. C. Neish (Section V), elected in 1960, also received their diplomas and signed the Charter Book.

(c) Other Meetings

Sectional meetings were held on June 5, 6, and 7. The public was invited to hear the general symposium on "Population and Civilization" and the sectional symposia on "The Problem of Population in Canada" and "Possibilities of Colonization of North Canada."

On Tuesday evening at 7.00 P.M., the City of Montreal gave a buffet at the Chalet de la Montagne.

Immediately following this buffet the medals were presented—in the Auditorium, Physical Sciences Centre—to this year's winners, and the President gave his presidential address entitled: "Earth Sciences and the Royal Society of Canada," which appears as Appendix A.

(d) Second General Meeting

The second general meeting of the Society was held at 4.00 P.M., on Wednesday, June 7. The Secretaries of the sections presented their reports, which were approved. It was moved by M. Guy Sylvestre, seconded by Dr. George F. G. Stanley, that the Report of Council be adopted. CARRIED.

The Report of the General Nominating Committee was read by Dr. George F. G. Stanley. The following Fellows were nominated for office: President, Dr. A. R. M. Lower; First Vice-President, Dr. W. H. Cook; Second Vice-President, M. Jean-Marie Gauvreau; Honorary Secretary, M. Guy Sylvestre; Associate Honorary Secretary, Dr. S. C. Robinson; Honorary Treasurer, Dr. J. D. Babbitt; Associate Honorary Treasurer, Dr. J. W. Hopkins; Honorary Editor, Dr. G. W. Brown; Honorary Librarian, Dr. W. Kaye Lamb. It was moved by Dr. G. de B. Robinson, seconded by Dr. T. W. M. Cameron, that the Report of the General Nominating Committee be adopted. CARRIED.

It was moved by Dr. J. D. Babbitt, seconded by Dr. N. E. Gibbons, that the accounts of the Royal Society of Canada be audited next year by the firm of Milne, Honeywell, and Burpee, chartered accountants. CARRIED.

It was moved by Dr. G. de B. Robinson, seconded by M. Guy Sylvestre, that the Honorary Treasurer, Dr. J. D. Babbitt and the Executive Secretary, Mrs. Lea Métivier, be given authority to handle the funds of the Royal Society. CARRIED.

Dr. Pierre Demers submitted a brief on the situation of the French-speaking members resulting from the reorganization of the scientific sections, and his representations were referred to the Council of Section III for consideration.

Dr. M. Y. Williams expressed the thanks of the Society to: Dr. F. Cyril James, President of McGill University, and to the University for their kind-

ness in affording the facilities of the University for this meeting and for the banquet offered to the Fellows and their wives;

the City of Montreal for the excellent reception provided on Tuesday evening;

the local Committee for their co-operation in arranging all matters pertaining to the meetings;

the members of the Press and radio stations;

the National Film Board for the showing of the film "The Universe" on Wednesday evening.

Dr. A. R. M. Lower took the Chair and expressed his appreciation of the honour which the Society had paid him in electing him to the Presidency.

Dr. Lower expressed the thanks of the Society to the outgoing President and Council for the excellent way in which they had conducted the affairs of the Society in 1960–61.

The meeting was adjourned at 4.50 P.M.

Dr. A. R. M. Lower invited the new Council to meet at once in the Engineering Faculty Room.

PRESENTATION OF MEDALS

Médaille Pierre Chauveau

Gérard Malchelosse

J'ai l'honneur de vous présenter M. Gérard Malchelosse, le récipiendaire de la médaille Chauveau pour l'année 1961. Né à Montréal en 1896, M. Malchelosse a été tour à tour journaliste, comptable, directeur technique de la bibliothèque de Saint-Sulpice, puis libraire. Editeur de nombreux ouvrages et animateur dynamique, il a puissamment contribué au développement littéraire et historique chez nous durant le dernier demi-siècle. Diplomé de l'école du Plateau, il travailla également à *La Presse*, au *Canada*, au *Passe-Temps* et il fonda, en 1916, avec Casimir Hébert, *Le Pays Laurentien* qu'il diriga trois ans.

Intéressé à toutes les questions nationales et historiques, membre de la Société Saint-Jean-Baptiste de Montréal, des Ecrivains canadiens, de la Société Historique de Montréal, de la Canadian Historical Association, de la Société canadienne de l'Histoire de l'Eglise catholique, membre correspondant de l'Institut d'Histoire de l'Amérique française, membre correspondant du Musée du Nouveau-Brunswick, membre-fondateur de la Société des Dix, ancien président de l'Amicale Champlain, de la Bibliographical Society of Canada, après en avoir été dix ans le secrétaire français, fellow de l'American Society of Genealogists, M. Malchelosse est l'auteur de nombreux ouvrages, entre autres *Benjamin Sulte et son œuvre, Cinquante-six ans de vie littéraire, Michel Bibaud, François-Marie Perrot, Les Forts du Richelieu, Le Fort de Chambly, Le Régiment de Carignan, Pseudonymes canadiens, Le Poste de la Rivière Saint-Joseph au Michigan, Jacques Cartier va à Hochelaga*, et de multiples généalogies.

L'œuvre capitale de M. Malchelosse est, sans doute, la publication de vingt-trois volumes d'écrits divers et épars de son maître Benjamin Sulte, de qui il a hérité d'une bibliothèque qui, dit-on, est l'une des plus riches en histoire canadienne. Il fut également le fondateur et secrétaire du Comité de revision du Dictionnaire Tanguay.

Son goût de l'histoire lui vient de Benjamin Sulte. Féru de généalogie et de bibliographie, il a jeté des clartés sur les sujets suivants : faux sauniers, filles du roi, prisonniers et fils de famille, coureurs de bois, milice et troupes de la Marine, les régiments de Carignan, Meuron, Watteville, les Juifs dans l'histoire canadienne, la Seigneurie Saint-Paul du Labrador, les procès de sauvagesses sous le régime français, la bibliothèque acadienne, l'histoire des vins au Canada, et de bien d'autres points de la grande et de la petite histoire.

La centaine d'index qu'il a dressés pour divers ouvrages pour les *Mélanges historiques* de Sulte, les *Cahiers des Dix*, la *Revue d'Histoire de l'Amérique française* et autres publications constituent un apport considérable à l'his-

toire. Mais c'est particulièrement à cause du rôle irremplaçable que M. Malchelosse a joué dans la Société des Dix dont il fut l'un des fondateurs et dont il est le secrétaire depuis vingt-cinq ans que les membres de la Section française de la Société Royale du Canada ont voulu reconnaître pour ce travail discret mais tenace en lui décernant l'honneur qui lui échoit ce soir. Messieurs, M. Gérard Malchelosse, récipiendaire de la médaille Chauveau pour 1961.

LOUIS-PHILIPPE AUDET

FLAVELLE MEDAL

C. P. Leblond

I consider it not only a privilege, but also a personal pleasure, to have the honour of presenting for the Flavelle Medal, 1961, my friend and colleague Charles Philippe Leblond. Born in the bustling city of Lille in northeastern France, he received his first degree in science at the University of Nancy, his degree in Medicine at Paris, his Ph.D. at Montreal, and a later doctorate in science from the Sorbonne. A Rockefeller Fellowship brought him to North America—to Yale—and he must have found it to his liking since, though he returned to Paris in 1938, we soon find him in Rochester; in 1941 he came to McGill and there, save for some years of service in the war, he has remained and since 1957 has been Chairman of our Department of Anatomy.

He brought from his beloved master in France an interest in the localization of ascorbic acid in the cells and tissues of the body; is perhaps most widely known for his studies on the biogenesis and fate of the hormones of the thyroid gland; but has also made most fundamental contributions of the rate and mechanism of replacement of one generation of cells by another in various organs, and of the process of calcification in bones and teeth.

A survey of his work impresses one by its versatility. He remains a master of classical histological techniques; but when his problems have seemed more amenable to attack by biochemical or enzymatic methods, or by the use of radio-active isotopes or of the electron microscope, or various combinations of these tools, he masters the new methodology without apparent effort and uses it with an elegance often surpassing the efforts of the originators of the techniques; he has touched nothing that he has not adorned. All those who heard his address to Section V, on the thyroid gland, must have been struck by the beauty and clarity of his more recent slides as contrasted with those of his first essays in which he was content to follow the processes that had seemed adequate to his predecessors.

Elegance, a truly Gallic elegance, characterizes all his work. His experiments are beautifully designed to yield crucial results yet to remain free from

the bias of presuppositions; his command of techniques is always impressive yet constantly evolving and improving; his discussion of his results is lucid, critical, and convincing.

This Society, of course, and rightly, honours him mainly as an investigator; but I should not pass over in silence his gifts as a teacher and administrator. No one has a keener eye to detect or a surer hand to control the individual differences between one graduate student and another, and he has launched many on very promising careers. I have found him a wise and helpful colleague, and across Canada there are many holders of grants from the National Cancer Institute who have found his advice and criticism to be both helpful and constructive.

D. L. THOMSON

LORNE PIERCE MEDAL

Robertson Davies

I have the honour to present to you for the Lorne Pierce Medal, Robertson Davies, Visiting Professor of English Literature at Trinity College in the University of Toronto.

In the twenty years since his return to his native Canada, Mr. Davies has become one of Canada's most versatile literary figures, achieving unquestioned distinction in each of his many literary roles: editor, essayist, novelist, playwright, and critic.

Since 1942, he has been editor of the *Peterborough Examiner*, which, under his guidance, has consistently maintained a standard of excellence which is an example for other Canadian journalists. It was in the columns of this newspaper that Mr. Davies first appeared in his role as essayist. His "Samuel Marchbanks" series, begun here, was to develop into two books, published in 1947 and 1949. These informal essays exposed a great many Canadian and North American follies and cultural shortcomings to the clear light of the author's intelligent, witty, and sometimes irreverent analysis.

In the fifties, Mr. Davies turned to the novel. *Tempest-Tost* (1951), *Leaven of Malice* (1954), and *A Mixture of Frailties* (1958) strike a note not often heard in Canadian fiction—the note of social satire. These serio-comic stories of a small Ontario city are amusing, sometimes even riotous; the author's ironic, witty, urbane, intellectual approach finds its fullest expression, perhaps, in the novel form. But the trilogy has at its core a serious and meaningful theme—that of the Canadian imaginative spirit and its struggle against its environment. The author's deep-felt love for the Canadian scene and his passionate desire for cultural and imaginative amelioration are evident through even the most biting satire.

It was as a critic that Mr. Davies returned to Canada in 1940, as Literary Editor of *Saturday Night*. Since then he has practised the art with amazing regularity and energy, considering his many other activities. His literary criticisms, book reviews, and commentaries on the allied arts have appeared in his newspaper; in many of the major Canadian periodicals; more recently, in a syndicated weekly newspaper column "A Writer's Diary," with national distribution; and most recently, with the publication in the United States and Canada (1960) and in England (1961) of *A Voice from the Attic*, in book form. The appearance of this book has gained for Mr. Davies an international reputation as an informed but unpedantic scholar, and as a sophisticated and intellectual observer who comments with wit and perception but without affectation, on the world of letters and the arts.

In the realm of the theatre, Robertson Davies' achievements have been equally remarkable. Following his professional activity in England as an actor, writer, and teacher, he has given freely of his talents at home. His advice and enthusiasm and participation have been real factors in the recent growth and expansion of both amateur and professional theatre in Canada. A Governor of the Stratford Shakespearean Festival, he has written three books (in collaboration with Tyrone Guthrie) about Stratford's activities. He has also published a study of Shakespeare's theatre, and a guide for young actors. Most important, as a playwright he has published six plays, which have been produced, with real success, at home and abroad. His most recent play, *Love and Libel*, was produced on Broadway last fall, following a tour in Canada and the United States. It will be produced again in England this fall by the Theatre Guild.

In each one of his roles—as editor, essayist, novelist, playwright, critic—Robertson Davies' contribution to Canadian letters has been noteworthy. His combined successes in all five make his achievement almost unique. His recent acceptance of a new role—that of Master-Designate of Massey College at the University of Toronto—will undoubtedly prove fruitful both for him and for his fellow Canadians.

F. R. Scott

Tyrrell Medal

Guy Frégault

J'ai l'honneur de vous présenter, pour la médaille Tyrrell, le docteur Guy Frégault, ci-devant directeur de l'Institut d'Histoire de l'Université d'Ottawa et, depuis plusieurs semaines, sous-ministre du Ministère des Affaires culturelles de la Province de Québec.

Toute la vie du docteur Frégault a été consacrée à la cause de l'Histoire : après ses humanités au College de Saint-Laurent, au College Brébeuf et à l'Université de Montréal, il obtient, en 1942, son Ph.D. en Histoire de

l'Université Loyola, à Chicago. Après un bref séjour aux Archives de la Province, à Québec, le docteur Frégault revient à l'Université de Montréal, où il sera professeur à la Faculté des Lettres, directeur de l'Institut d'Histoire, Vice-doyen de sa Faculté avant de passer, il y a deux ans, à la direction d'un Institut similaire, à l'Université d'Ottawa.

Les sections des humanités et des sciences sociales de la Société Royale du Canada veulent honorer aujourd'hui l'œuvre de l'historien éminent qui s'est affirmé, depuis 1944, par des ouvrages qui font autorité et dont il faut admirer les qualités qui marquent les œuvres définitives. Il suffit, en effet, de mentionner les plus importants de ces travaux pour bien comprendre que la médaille Tyrrell ne pouvait avoir un plus digne récipiendaire : *Iberville le Conquérant* (1944), *La Civilisation de la Nouvelle-France* (1944), *François Bigot, administrateur français* (1949), *Le Grand Marquis, Rigaud de Vaudreuil et de la Louisiane* (1952), *La Guerre de la Conquête* (1955) constituent, en effet, une production de haute qualité qui témoigne des dons exceptionnels du chercheur et de l'historien aussi bien que des qualités incontestables de l'écrivain.

Le docteur Guy Frégault vient tout juste d'accéder à un poste de commande, celui de Sous-Ministre des Affaires culturelles de la Province de Québec : cette promotion constitue un témoignage non équivoque pour les qualités transcendantes de celui qui devient le premier titulaire de cette charge : tous les amis du docteur Frégault souhaitent vivement que l'exaltation de la culture ne se fasse pas trop ici aux dépens de l'Histoire et des recherches historiques. Mesdames, Messieurs, le docteur Guy Frégault, récipiendaire de la médaille Tyrrell pour 1961.

F. R. Scott

Henry Marshall Tory Medal

R. M. Petrie

Mr. President, I have the honour to present for the award of the Henry Marshall Tory Medal, Robert Methven Petrie, Director of the Dominion Astrophysical Observatory, Royal Oak, British Columbia. Dr. Petrie is internationally known for his spectroscopic studies of stars.

Born in Scotland, Dr. Petrie came to Canada while very young and received his schooling in British Columbia, as well as his bachelor's degree from the University of that province. In his youth, astronomical enthusiasm was so strong that even before he entered university, he began in 1924 to spend his summers as a volunteer assistant at the observatory of which he is now Director. During the period 1928–35 he received his Ph.D. from the University of Michigan and was an instructor there. At Michigan he worked to great effect on the development of celestial kinematography which has now produced spectacular motion pictures of the seething gases of the sun.

There, too, began his interest in problems of spectroscopy which he has continuously pursued to great advantage. Since 1935 Dr. Petrie has worked at the Dominion Astrophysical Observatory, rising in rank to the post of Director in 1952.

Among his areas of research are the atmospheric motions of stars, and the determination of the accurate magnitudes of the components of spectroscopic binary stars from profiles of spectral lines. These data have led to an improvement on the important mass-luminosity relation first established by Eddington. He has also devoted time to determining the distances of the very hot stars, and to a calibration of the radial-velocity measurements to ensure that they are measured on the same scale as measures made in our own solar system. (This study has involved the establishment of criteria to distinguish luminosities of giant and dwarf stars.) The highly precise wavelength determinations made by Dr. Petrie have been incorporated in the reports of the International Astronomical Union and are now universally accepted as standard.

One of his main projects, the dynamics of the galaxy, a programme of many years' duration, which carries on the well-known earlier work by J. S. Plaskett and J. A. Pearce, is in the final year of completion. The observations are already made, and will yield an improved understanding of the structure of our galaxy.

During his directorship Dr. Petrie has energetically added to the facilities and equipment so that this forty-year old observatory has most modern facilities for research, including a new 48-inch reflecting telescope of superior design.

In addition to his extensive research programmes and administrative work, Dr. Petrie has given generously of his time to serve various scientific organizations. He is a Vice-President of the International Astronomical Union, the first Canadian to be so honoured. He is also Vice-President of the Astronomical Society of the Pacific, and has served as President of Section III of the Royal Society of Canada (1956), as President of the Royal Astronomical Society of Canada (1955–56), and as Vice-President of the American Astronomical Society (1954–56).

It is my happy privilege to present Robert Methven Petrie for the award of the Henry Marshall Tory Medal.

HELEN S. HOGG

WILLET G. MILLER MEDAL

W. H. White

Section IV wishes to honour William Harrison White, Professor of Geology at the University of British Columbia, for his outstanding contributions to Canada as a scientist and teacher of geology. In doing this we are

not alone, for he was recently awarded the Barlow Memorial Medal by the Canadian Institute of Mining and Metallurgy jointly with Dr. K. C. McTaggart and Dr. R. M. Thompson for a paper on the "Geology and Gold Deposits of Highland Valley, British Columbia."

Professor White was born at Wabigoon, Ontario, but most of his life and work have been in British Columbia. He received the Bachelor's and Master's degrees in Geological Engineering from the University of British Columbia and the Ph.D. degree from the University of Toronto.

During the war years Dr. White served as an officer in the Royal Canadian Air Force in India and Burma. After the war, he worked for the British Columbia Department of Mines and published numerous papers on mining properties in Western Canada. In 1947 he joined the staff of the University of British Columbia and was promoted to full professor in 1958.

Dr. White's most outstanding contribution to western Geology was published by the American Association of Petroleum Geologists in 1959. This paper, entitled "Cordilleran Tectonics in British Columbia," was read by invitation at the Edmonton meeting of this Society. In it Professor White summarized the geological history of the Canadian Cordillera and for the first time delineated the times of orogeny and subsidence over this vast area.

Dr. White has profoundly influenced the ambitions and activities of his students; vigorous leadership in organizing and running the Field School in Geology each summer has served to pass on to them his deep conviction that careful field work is a prime essential for real progress in Geology. This has sustained and enhanced the fine reputation as field geologists long established by graduates of the University of British Columbia.

Mr. President, it is a privilege for me to present Dr. William Harrison White as recipient of the Willet G. Miller Medal.

J. E. GILL

REPORTS OF SECTIONS

Rapport de la Section I

La Section I a tenu cinq réunions auxquelles ont assisté trente-deux sociétaires : MM. Louis-Philippe Audet, Louis Baudouin, Marie-Louis Beaulieu, Jean Béraud, Charles-Marie Boissonnault, Jean-Charles Bonenfant, Benoît Brouillette, Cécile Chabot, Pierre Daviault, Raymond Douville, Marcel Dubé, Marcel Valois, Marcel Faribault, Jean-Marie Gauvreau, Gratien Gélinas, Léopold Lamontagne, Jean-Marie Laurence, Maurice Lebel, Jean-Jacques Lefebvre, R.F. Clément Lockquell, Léon Lortie, Mgr Olivier Maurault, Claude Mélançon, Gérard Parizeau, Dr Adrien Plouffe, Guy Sylvestre, Yves Thériault, Madame Germaine Guèvremont, Jean Filiatrault, M. l'abbé Gérard Dion, André Laurendeau, Pierre Dagenais.

La première séance fut consacrée à la discussion des affaires courantes; au cours des autres réunions, un colloque fut présenté sur le centenaire de l'Ecole littéraire de Québec; de plus, une dizaine de travaux préparés par quelques membres de la section suscitèrent des discussions fort intéressantes. Nous avons également participé au colloque général qui groupait toutes les sections, colloque dont le thème était « Population et civilisation ». Enfin une réunion conjointe des Sections I et II a discuté le problème de la population au Canada. Outre les membres de la Section, de nombreux invités ont assisté à la plupart de nos séances.

A l'occasion de deux réunions d'affaires, les membres de la Section I ont adopté la motion suivante : « sur proposition de M. Pierre Daviault, ancien président général de la Société Royale du Canada et avec l'appui de M. Léopold Lamontagne, professeur au Collège militaire royal de Kingston, les membres de cette section regrettent qu'à la première réunion générale de la Société, tenue le lundi matin, 5 juin 1961, à l'université McGill, le caractère bilingue de la Société ait été oublié et qu'aucune parole n'ait été prononcée en français contrairement à l'usage établi ».

Nous avons eu à déplorer cette année la perte de trois de nos sociétaires : S.E. M. l'ambassadeur Jean Désy, MM. Jean Charbonneau et Jean-Marie Nadeau. D'autre part, nous avons accueilli cinq nouveaux membres : M. Pierre Dagenais, M. l'abbé Gérard Dion, M. Jean Filiatrault, Mme Germaine Guèvremont et M. André Laurendeau.

Le rapport du Conseil fut approuvé.

Les élections ont donné les résultats suivants :

Président : T.R. Père Louis-Marie Régis, o.p.
Vice-président : Jean-Charles Bonenfant
Secrétaire : Louis-Philippe Audet
Représentant supplémentaire au conseil : Antoine Roy
Comité général des nominations : T.R. Père Louis-Marie Régis et Jean-Charles Bonenfant

Comité de la médaille Chauveau : T.R. Père Louis-Marie Régis, Louis-Philippe Audet, Robert Elie, Roger Duhamel, R.F. Clément Lockquell

Comité de la médaille Lorne Pierce : Guy Sylvestre, Jean-Charles Bonenfant, Maurice Lebel

Comité de la médaille Tyrrell : T.R. Père Louis-Marie Régis, Jean-Charles Bonenfant, Raymond Douville

Comité des candidatures : T.R. Père Louis-Marie Régis, Jean-Charles Bonenfant, Louis-Philippe Audet, Antoine Roy, Jean-Jacques Lefebvre, Roger Duhamel, Léopold Lamontagne, Guy Sylvestre

Comité des bourses : Maurice Lebel, Léon Lortie, Jean-Paul Vinay, Pierre Daviault, Louis-Philippe Audet

Comité du programme (section) : T.R. Père Louis-Marie Régis, Jean-Charles Bonenfant, Léopold Lamontagne, Louis-Philippe Audet.

Comité du pogramme (général) : T.R. Père Louis-Marie Régis, Louis-Philippe Audet

Comité des projets (planning) : Léon Lortie

Comité des publications : Louis-Philippe Audet

Comité d'édition : Jean-Charles Bonenfant, Maurice Lebel, Pierre Daviault

Il est proposé par Louis-Philippe Audet, appuyé par Jean-Charles Bonenfant que le rapport de la Section I soit adopté.

Report of Section II

Section II held two business meetings and four sessions, a joint session with Section I on Canadian demography, a session on Canadian history, one on ancient history and art, one on modern psychology, and one in which the presidential addresses of this year's President and the immediate Past President were read. Forty Fellows attended the sessions. Eight new Fellows were welcomed, including two elected in previous years. The Section noted with deep regret the death of Dr. Chester New. The resignation of Dr. E. H. Gilson was noted.

Section II approved the Report of Council.

Section II approved the appointment of a committee to examine and report upon the advisability of reorganizing Section II.

Section II approved a motion that Council be asked to explore the possibility of the Canadian funds blocked in Italy being made available for scholarship purposes in a manner similar to scholarships previously available in France and Holland, such scholarships to be administered by the Royal Society of Canada or the Canada Council.

The following officers and committee members were elected:

President: G. E. WILSON
Vice-President: ROY DANIELLS
Secretary: GEORGE F. G. STANLEY
Additional Member of Council: F. E. L. PRIESTLEY
General Nominating Committee: A. G. BAILEY, GEORGE F. G. STANLEY
Advisory Committee (Nominations, New Fellows): ROY DANIELLS (*Chairman*), B. S. KEIRSTEAD, G. W. SIMPSON, W. KIRKCONNELL, G. M. GRUBE, G. F. G. STANLEY (*Secretary*)
Medal Committees: Lorne Pierce Medal: G. E. WILSON, ROY DANIELLS, KATHLEEN COBURN
Tyrrell Medal: G. E. WILSON, ROY DANIELLS, W. L. MORTON
Programme Committee and Editorial Committee: E. T. SALMON (*Chairman*), J. J. TALMAN, F. A. KNOX, T. A. GOUDGE, G. F. G. STANLEY (*Secretary*)

It was moved by George F. G. Stanley, and seconded by G. E. Wilson that this report be adopted.

REPORT OF SECTION III

The Annual Meeting of the Section was held on Monday afternoon, June 5, to hear the Presidential Address by President Helen Hogg and an invited paper by the Tory Medallist for 1961, Dr. R. M. Petrie. Following this the business meeting was convened.

President Hogg reported that there had been no deaths among the Fellows of Section III during 1960.

The new Fellows of Section III were introduced to the Section. These were: R. E. Burgess, Professor of Physics, University of British Columbia; A. G. W. Cameron, Associate Research Officer, Physics, Atomic Energy of Canada Limited; Charles Fox, Professor of Mathematics, McGill University; A. F. McKay, Vice-President, Monsanto, Canada, Ltd., organic chemist; M. A. Preston, Professor of Physics, McMaster University; A. E. R. Westman, Director, Department of Chemistry, Ontario Research Foundation.

The Report of Council was unanimously approved by the Section on motion of Dr. Herzberg, seconded by Dr. Petrie.

The names of the Rutherford Fellows were reported to the Section. These were R. L. Armstrong, B. A., Ph.D., Toronto, who will continue the study of physics at Oxford, and D. R. Moorcroft, B.Eng., Toronto, Ph.D., Saskatchewan, who will also continue the study of physics at Stanford University.

The names of the nominees for Chairman and Secretary of the following

subject subdivisions were presented to the Section and approved by the meeting. These were:

Mathematics: N. S. MENDELSOHN (*Chairman*), M. S. MACPHAIL (*Secretary*)
Physics: G. M. VOLKOFF (*Chairman*), L. G. ELLIOTT (*Secretary*)
Chemistry: C. B. PURVES (*Chairman*), R. MCINTOSH (*Secretary*)
Interdisciplinary: C. S. BEALS, H. B. HACHEY

Certain committees of Section III were then assigned to the subject divisions for the nomination of members. These were the C.I.C. Medal Committee to Chemistry; the Canadian National Committee of the International Union of Pure and Applied Chemistry to Chemistry; the Canadian National Committee of the International Union of Pure and Applied Physics to Physics; the Representatives on the Editorial Boards of the Canadian Journals of Research to Physics and Chemistry; the Committee on Oceanography to the Interdisciplinary Committee; the Canadian Committee of the International Astronomical Union to the Interdisciplinary Committee. On the motion of Dr. Misener, seconded by Mr. Davies it was decided to reappoint the members of the Rutherford Committee. On the motion of Professor Shrum, seconded by Dr. Derry, it was decided to reappoint the Editorial Committee for the *Transactions of the Royal Society of Canada.*

Some discussion, initiated by Professor Volkoff, then took place on the procedures for forming the selection committees of the subject divisions and for the election of new Fellows. The Secretary requested that the secretary of the new Section III and the officers of that Section should be asked to do everything possible in the future to provide printed programmes of the meeting, certificates for cheaper travel fares, invitations to dinners, and so on, to the contributors to the technical sessions. It was stressed that this year, and at the last meeting, a great many of the papers were given by persons not Fellows of the Society.

The meeting then adjourned in order to permit the members of the subject divisions to organize the divisions.

At the meeting of the chemistry subject division Dr. Purves, the Chairman, was in the chair. A selection committee for new Fellows was formed, consisting of Dr. Purves, Dr. McIntosh, and Dr. K. G. Blaikie. The representative on the Editorial Board of the *Canadian Journal of Chemistry*, Dr. D. J. Le Roy, was re-elected. Dr. K. J. Laidler was named as the representative on the Canadian National Committee of the International Union of Pure and Applied Chemistry. It was decided that the programme committee of the subject division should comprise the officers of the division with power to add. Dr. Pearson expressed the view that the symposium type of technical session of the past several years be continued and this met with general approval. On the motion of Dr. Maass, seconded by Dr. Laidler, it was approved that the subject division might recommend that Dr. Giguère continue as the representative from chemistry on the Rutherford Committee.

This would be consistent with the decision of Section III that the Rutherford Committee be re-appointed.

The Section held ten technical sessions. Generally these took the form of symposia, and opinion seems clearly in favour of this type of session.

Report of Section IV

A meeting of Section IV of the Royal Society of Canada was held on June 5 at 2.00 P.M. with the President, J. E. Gill in the chair.

The President noted with regret the death of Cyril W. Knight during the past year and, after a brief review of his career, the Section observed a silence in his memory. The President noted the retirement from active membership of J. F. Walker. The President welcomed newly elected fellows.

Minutes of the Annual Meeting held in Kingston in 1960 which had been circulated were adopted as read, with two minor amendments noted on them, on motion by H. S. Armstrong, seconded by F. F. Osborne.

The President noted from the previous minutes the general tenor of strong opposition to the proposed amalgamation of Sections III, IV, and V. He noted that he had polled some thirty members of Section IV during the year and had found that they generally agreed that no effort be made to reopen the issue and that everything that could have been done had been done by the representatives on the Joint Committee on Reorganization. The President further pointed out that there would be some small advantage in the new arrangement such as working in closer contact with those in other disciplines; drawing the attention of workers in other fields to geological problems and that of geologists to problems in other fields. The President then reviewed the new organizational setup and the work of the Nominating Committee.

The President pointed out that even under the new organization the subject subsection to which Section IV will belong will still be responsible for some duties. After some discussion as to the legally constituted makeup of the committee the following officers were elected:

Willet G. Miller Medal Committee: Chairman: D. M. Baird
Members: F. H. Edmunds, L. G. Berry, V. K. Prest, J. H. Hodgson

The meeting agreed to the President's suggestion that the title of the Advisory Committee (Nomination of New Fellows) be changed:

Committee on New Fellows: Chairman: Y. Fortier
Members: D. F. Hewitt, J. S. Stevenson, W. W. Moorhouse, D. G. Garland, I. W. Jones, D. M. Baird (*Secretary*)

J. E. Hawley asked about the method of selection of new Fellows, the method of nomination and related matters. After some discussion it was moved by J. E. Hawley, seconded by J. S. Stevenson that the Committee

on New Fellows be asked to study the matter of nomination and election of new Fellows and report to the next meeting. CARRIED.

The President reported that the soils symposium volume—*Soils in Canada*—is now completed and expressed thanks to R. F. Legget for a job well done.

The Nominating Committee of F. F. Osborne and J. E. Gill proposed a slate of officers for the new subsection as follows:

President: H. S. ARMSTRONG
Secretary: D. M. BAIRD

Some discussion followed on desirability of having a Vice-President and on motion by H. S. Armstrong, seconded by H. S. Bostock, the Nominating Committee was asked to nominate a Vice-President for the coming year and suggested a procedure for the following years. G. B. Langford was proposed and elected.

Some discussion on the subject of publications under the new organization took place on question by J. E. Hawley. Nominating Committee of F. F. Osborne and J. E. Gill proposed J. E. Hawley and I. W. Jones to represent subsection B on the General Committee. Agreed. F. F. Osborne reported that in the general negotiations on reorganization it had been promised that the publications policy of Section IV could be contined under the new organization.

J. T. Wilson raised the possibility of a National Research Council publication in the earth sciences to parallel the ones now published in other disciplines. General discussion of publications in geological sciences in Canada and the Royal Society followed.

REPORT OF SECTION V

On account of the amalgamation of Sections III, IV, and V, officially completed on June 7, this meeting was the last one for Section V. Dr. Thomson was presiding. The President explained in a few words the changes in organization about to take place, and suggested that the main business to be dealt with at the present meeting was to elect the officers of the three subject divisions (of the new amalgamated Section III) related to the present Section V.

The suggested members of the subject divisions approved by the meeting were as follows:

Plant biology: R. GLEN (*Convener*), R. POMERLEAU (*Rapporteur*)
Animal biology: L. P. DUGAL (*Convener*), F. NEAVE (*Rapporteur*)
Microbiology and biochemistry: N. E. GIBBONS (*Convener*), H. B. COLLIER (*Rapporteur*)

It was moved by Dr. N. E. Grace, seconded by Dr. R. E. Foerster, that the officers of the new Section III be requested to organize, within the 1962

general meeting, a special meeting of the members of the old Section V, to appraise the progress of the amalgamation. CARRIED.

Moved by Dr. N. E. Grace, seconded by Dr. Simard, that the secretary be allowed to turn over all minute books, records of nominations of Fellows, etc. to the Secretary of the new Science Section (new Section III). CARRIED.

The report of the Council was approved on a motion by Dr. E. G. Young, seconded by Dr. K. C. Fisher.

Section V has lost one of its members during the year, Dr. D. S. Rawson, who died in December, 1960.

Finally, Dr. K. C. Fisher moved a vote of thanks to the President and Secretary of the Section for their services during the year. The meeting was adjourned at 5.30 P.M.

APPENDIX A

PRESIDENTIAL ADDRESS
DISCOURS PRÉSIDENTIEL

PROCEEDINGS OF THE ROYAL SOCIETY OF CANADA
VOLUME LV : SERIES III : JUNE, 1961

DISCOURS PRÉSIDENTIEL PRESIDENTIAL ADDRESS

The Earth Sciences and the Royal Society of Canada

M. Y. WILLIAMS

IN these momentous days of sub-atomic discoveries and astounding applications of physical science, it is time to review advances made in earth sciences, and more particularly in their relation to the Royal Society of Canada. A measure of this relationship may be arrived at by reviewing the contributions made by the men elected to leadership in the Society.

In 1882, when the Royal Society was established, Section IV, including the geological and biological sciences, had nine members engaged in research in geology, palaeontology, and botany as applied to geology. The President of Section III was a geological and mineralogical chemist. In 1960, Section IV, restricted to the geological and geophysical sciences, had ninety-one active and seven retired members.

This ten-fold increase reflects the growth of the population of Canada (over three-fold), as well as the advances in earth science and the development of branch sciences such as seismology, geophysics, and physical geography. The membership is also established arbitrarily by the Society itself. In reality those engaged in earth sciences in Canada today are many, each group having its own society.

The committee recently appointed by this Society to reorganize the science sections, reported that there are fifteen geographers and forty-two geologists with Ph.D.'s who are staff members in Canadian universities with the rank of assistant professor or higher, and 103 geological scientists, in the Department of Mines and Technical Surveys.

On the occasion of the twenty-first session of the International Geological Congress held in Denmark, Finland, Iceland, Norway, and Sweden in 1960, there were 106 registrants from Canada of which sixty were present as delegates. It was estimated that there are about 5,000 geologists working in Canada. At present the Alberta Society of Petroleum Geologists has 1,280 members, 94 per cent being active.

This phenomenal growth has been brought about by the demand for earth scientists, stimulated by the war and rehabilitation and also by a healthy appreciation of what earth science means. For the globe we live on carries the story of its own growth and of the development of the plants and animals around us and of man himself. Engineers, of whatever sort, ignore earth science at their peril; historians overlook the foundation of

their studies; agriculturists fail in interpreting their soils, climate, and consequent crop possibilities. Those who would probe outer space would do well to give careful study to the one heavenly body of ready access.

Les sciences de la terre se développèrent tôt dans ce qui allait devenir les provinces du Canada. Le Collège du Nouveau Brunswick, issu en 1800 de l'Académie des Arts et des Sciences, avait déjà un cours de géographie. Le Dr Abraham Gesner, géologue en chef de la Province du Nouveau Brunswick de 1838 à 1846 dirigea un relevé préliminaire et dessina la carte de la province. La Commission géologique du Canada s'est acquis une réputation mondiale grâce à ses réalisations sous la direction de Sir William Logan de 1842 à 1869 ainsi que sous celle de son successeur, le Dr A. R. C. Selwyn, de 1869 à 1894. Lorsque la Société royale fut fondée en 1882 on enseignait déjà la géographie à l'Université du Nouveau Brunswick où se trouvait le professeur L. W. Bailey, ainsi qu'à l'Université McGill où enseignait le Dr J. W. Dawson. Les sciences de la terre étaient donc pratiquées par des géologues, des professeurs et par quelques amateurs qui étaient tout prêts à apporter leur contribution à une académie nationale.

C'est le Dr J. W. Dawson, Principal de l'Université McGill, qui fut le premier Président de la Société. Des vingt membres de la Section IV, qui groupait alors les sciences géologiques et biologiques, huit étaient des géologues, et un neuvième était un botaniste à l'emploi de la Commission géologique du Canada. D'autre part, le Président de la Section III, qui réunissait les sciences mathématiques et physiques, était un chimiste-géologue.

On peut donc dire que ceux qui se spécialisaient dans les sciences de la terre ont contribué dans une large mesure à l'établissement de la Société royale qui pour sa part, en plus de consacrer leur renommée, fournissait aux savants de toutes les parties du pays l'occasion de se rencontrer et de discuter leurs travaux.

L'heureuse influence de ces réunions et des publications de la Société a peut-être été appréciée davantage par ceux de ses membres qui vivaient dans les centres les plus éloignés de notre vaste pays.

New Brunswick was first in the field of earth science. The Provincial Academy of Arts and Science established at Fredericton on December 13, 1785, was made the College of New Brunswick on February 12, 1800. Its curriculum included geography. In 1838 Dr. Abraham Gesner of Cornwallis, Nova Scotia, was appointed Provincial Geologist of New Brunswick and held that position untl 1846, when the survey was abandoned. He published five reports of 440 pages with a geological map. Mining development was stimulated.

The union of the two Canadas in 1840 saw the establishment of the Geological Survey of Canada in 1841, and its initiation in 1842 under the competent direction of William E. Logan. Born in Montreal, educated in

Edinburgh, Logan had already made his reputation in the complex geology of Wales before coming back to Canada to start investigations in one of the toughest parts of a little-known continent and on rocks belonging to the older section of the geological column, which had not been charted elsewhere. With the able assistance of Alexander Murray and James Richardson, geologists, Elkanah Billings, palaeontologist, and T. Sterry Hunt, chemist, and in close co-operation with James Hall, Director of the New York State Survey, Logan published sixteen reports. His general summary, *The Geology of Canada*—a large octavo, of 983 pages—was accompanied by an atlas with geological map and sections. The beautifully coloured map included the Maritime Provinces and a considerable portion of the United States. Published in 1863, *The Geology of Canada* was an important factor in bringing about the Confederation of Canada with the Maritime Provinces in 1867. Indeed, the Geological Survey of Canada had so favourably attracted attention in British Columbia that it was a factor in bringing that far-off colony into Confederation in 1871, one stipulation being that necessary geological investigations must be done within its borders. Logan also looked toward Newfoundland and directed Alexander Murray, assisted by James P. Howley, in a survey of its geology which began in 1864 and continued until 1880.

Logan was well in advance of his time in many phases of geology. He early accepted the glacial theory and explained the origin of the Great Lakes and their adjoining land forms on the basis of the action of ice. In his *Geology of Canada*, he described petroleum or rock oil as filling the cells of corals and other fossils in the Devonian, Corniferous (Onondaga) limestone of western Ontario. He observed some of the oil springs near Tillsonburg as being on the line of "the great anticlinal which runs through the western peninsula; and subordinate undulations of a similar character will be found connected with others." "The oil being lighter than water, and permeating with it the strata, naturally, rises to the highest part, which is the crown of the anticlinal." Thus the anticlinal theory of oil accumulation was explained.

Logan prepared a fine exhibit of Canadian minerals for the Paris Exhibition of 1855. This attracted much attention and the French Emperor made him a "Chevalier of the Legion of Honour." In 1856 Queen Victoria bestowed upon him a knighthood.

At the fifth general meeting of the Royal Society held in Ottawa, May 25–26, 1886, Sir William Dawson chose as the title of his Presidential Address to Section IV: *Some Points in which American Geological Science is indebted to Canada.* Sir William says in part:

> The ground was broken in 1823 by Dr. Bigsby's "Notes on the Geography and Geology of Lake Huron."
>
> This was followed up by important papers by Bayfield on the "Geology of the North Coast of the St. Lawrence" and on Lake Superior, and by papers on the Labrador coast and St. Paul's Bay by Lieut. Baddeley, while Ingall described the country drained by the St. Maurice.

It is not too much to say that these researches between the year 1820 and the institution of the Geological Survey of Canada in 1842 . . . placed Canada for the time in a very advanced and honourable position.

But the work of Sir William Logan, beginning in 1842 and continuing until his death, marks an epoch not only in our knowledge of the Laurentian and Huronian in Canada, but throughout the world.

Thus a contemporary recognized the leading role played by the first Director of the Geological Survey of Canada. By general agreement, Logan may be classed in first place among Canadian geologists.

When Logan retired in 1869 the Confederation of Canada was two years old and its Geological Survey was well manned and prepared to go forward under its new Director, Dr. A. R. C. Selwyn.

Dr. Alfred Richard Cecil Selwyn (1824–1902) was born in England and was for several years a member of the Geological Survey of Great Britain under De la Beche. From 1852 until 1869 he was Director of the Geological Survey of Victoria, Australia. Upon Sir W. E. Logan's retirement in 1869, Dr. Selwyn was appointed Director of the Geological Survey of Canada, holding this position until 1894.

The staff of the survey included H. M. Ami, E. Billings, and J. F. Whiteaves, palaeontologists; Robert Bell, George M. Dawson, James Richardson, and J. B. Tyrrell, geologists; and B. J. Harrington and T. Sterry Hunt, chemists.

With a highly organized survey which faced increasing demands upon it, Dr. Selwyn was chiefly engaged in administration. However, he made several reconnaissance trips into the field, the most extensive being in the upper valley of the Peace River of British Columbia in connection with Sir Sandford Fleming's search for a pass for a railway through the Rocky Mountains. Travelling variously by horse and canoe, Selwyn's party left Quesnel on June 5, 1875, and returned on October 20. They traversed the Crooked, Pack, and Parsnip rivers to Finlay Forks and Mt. Selwyn, which they climbed and named. They went down the Peace River to the mouth of Smoky River which they ascended for twenty miles. They ascended the South Pine River to Table Mountain which they climbed, and they made side trips to Moberly Lake and the west entrance to Pine Pass.

Illustrative of travel conditions, Selwyn writes:

We waited at Quesnel for the steamer till the 24th [they arrived October 20th] and after seven days of stage and steamboat travel landed in Victoria. Leaving there on the 10th of November, we arrived in Montreal on the 23rd, having been absent five months and twenty-seven days, during which we had travelled:

by railroad and steamboat	8,454 miles
by stage	548 miles
by pack-train, canoe and on foot	1,217 miles
Total	10,219 miles

Selwyn's comprehensive report deals with general geology, lignite blocks along the Parsnip River, economic minerals, climate, vegetation, agriculture,

and distances between posts. Full-page engravings made from photographs illustrate the country. Appendix I by Professor John Macoun of Albert College, Belleville, adds "Geological and Topographical Notes on the Lower Peace and Athabasca Rivers." Appendix II by J. F. Whiteaves deals with "Some of the Fossils Collected during the Expedition." Appendix III gives a "List of Coleoptera" by "Professor J. Le Conte of Philadelphia." There follows a "Report of Professor Macoun, Botanist to the Expedition."

Leaving Belleville on April 14, Professor Macoun reached San Francisco the morning of the twenty-seventh. "At noon the same day, I embarked on board the mail steamer 'Los Angeles' and reached Victoria on the morning of May 2nd." His report covers the flora, and environmental conditions of Vancouver and the Queen Charlotte Islands, the Fraser River valley, Stewart's River, Fort St. James, Fort McLeod, the Finlay and Parsnip rivers, and the Peace River to Lake Athabasca at Fort Chipewyan. From here, Macoun ascended the Athabasca and Clearwater rivers and by way of the Beaver River and portages made his way to Carlton on the Saskatchewan River. Starting from here in a light wagon "in the evening of the 9th of October, in the midst of a snow storm," the party "reached Winnipeg at dark on the evening of the 1st of November. . . . I left Winnipeg on the 5th of November and reached Belleville on the 13th." Selwyn's report, along with the three Appendices covers eighty-two pages; Macoun's seventy-six pages.[1]

These reports are obviously reconnaissance and of general interest, covering much territory not examined by the writers. They are, however, indicative of the unexplored character of the country and of the geographical, biological, and ecological investigations which were carried out in addition to geological studies. Under Selwyn's management, the Geological Survey of Canada made heroic strides in reconnaissance surveys and preliminary mapping throughout the length and breadth of the Dominion.

By 1882, Canadians were already prominent in earth science and their efforts had played an important part in welding together the diverse segments of northern North America into the Dominion of Canada, when His Excellency the Marquis of Lorne, Governor General of Canada, opened the first formal Session of the Royal Society of Canada at 4.00 P.M., Thursday, May 25, 1882, in the Senate Chamber of the Parliament Buildings, Ottawa. Its first President was Dr. John William Dawson, distinguished Principal of McGill University.

Principal (later Sir William) Dawson was the right man. Born at Pictou, Nova Scotia, in 1820, he was educated at Pictou Academy and the University of Edinburgh. Returning to Nova Scotia, he was made Principal of McGill University and Professor of Natural History in 1855. (He retired in 1893, and died in 1899.) A great organizer, a great humanist, a great educator, a great geologist, he linked earth science securely with intellectual development in Canada. His 383 publications on geological topics vary much

[1]Geological Survey of Canada, *Report of Progress, 1875–6.*

in scope, and his splendid contributions to palaeobotany form a basis for the study of fossil plants in Canada. The first edition of Dawson's *Acadian Geology*, published in 1855, set a pace in geological investigations and indicated the accomplishments of the science up to that time.

In 1882, only members of the Geological Survey and a very few teachers and private enthusiasts were eligible for election to the Royal Society to represent the earth sciences. Who were these men? Section IV, Geological and Biological Sciences, elected twenty members, nine of whom were geologists or palaeontologists: Dr. A. R. C. Selwyn, President of the Section; Dr. G. M. Dawson; Professor L. W. Bailey, Fredericton, N.B.; G. F. Matthew, St. John, N.B.; J. F. Whiteaves; Alexander Murray, Geological Survey of Newfoundland, St. John's; James A. Grant, Ottawa; Dr. Robert Bell; and Professor John Macoun. Thus five members of Section IV were members of the Geological Survey of Canada, and one was a collaborator in the botanical field; one member was director of the Geological Survey of Newfoundland; one was a professor at the University of New Brunswick; one was an amateur enthusiast at St. John, N.B., and one was a medical doctor and amateur enthusiast at Ottawa.

The first President of Section III, the Chemical, Mathematical, and Physical Sciences, and the second President of the Royal Society was Thomas Sterry Hunt, LL.D., F.R.S. of the Geological Survey of Canada. He was an energetic chemist-geologist who published some 230 papers dealing with the chemical composition of minerals, rocks, soils and waters, the genesis of rocks, ores, fossil resins, oils, silicates, etc. He was one of the first to point out the occurrence of oil along the anticlinals,[2] and his investigations stimulated discussion which has echoed down to the present day. Dr. Hunt was born in Norwich, Conn., September 5, 1826. In 1846–47 he was chemist to the Geological Survey of Vermont. From 1847 to 1872 he was chemist and mineralogist to the Geological Survey of Canada. From 1856 to 1862 he was Lecturer on Chemical Geology in Laval University, and later Professor of Chemistry and Mineralogy in McGill University. From 1872 to 1878 he was Professor of Geology at the Massachusetts Institute of Technology. He died in New York City February 12, 1892.

Following T. Sterry Hunt at varying intervals, fourteen geologists have been Presidents of the Royal Society: G. M. Dawson, 1893–94; A. R. C. Selwyn, 1895–96; Sir James A. Grant, 1902–03; Frank D. Adams, 1913–14; A. P. Coleman, 1920–21; W. A. Parks, 1925–26; Charles Camsell, 1930–31; Reginald W. Brock and G. A. Young, 1935–36; Robert G. Wallace, 1940–41; E. S. Moore, 1945–46; J. J. O'Neill, 1950–51; G. S. Hume, 1955–56; and M. Y. Williams, 1960–61.

Dawson, the son of J. W. Dawson, Principal of McGill University, was born in Pictou, Nova Scotia, August 1, 1849. He graduated from the London School of Mines in 1872. He established his international reputation

[2]*Montreal Gazette*, March 1, 1861; *Canadian Naturalist*, July, 1861; *Geol. Surv. Canada, 1863–1866*, p. 256.

when in 1873 he was geologist and botanist on the Survey of the 49th Parallel from the Rocky Mountains to the Lake of the Woods. He joined the Geological Survey of Canada in 1875 and succeeded Selwyn as Director in 1895, holding that office until the time of his death in Ottawa, on March 2, 1901.

What Logan was to eastern Canada, G. M. Dawson was to the West. His area of exploration was much larger; it included much younger rock formations; the western cordillera of British Columbia offered difficulties of interpretation, different in kind but as challenging as those faced by Logan in Gaspé, and the Laurentian shield.[3] Of all Dawson's strenuous and widely distributed explorations, that through northern British Columbia and the Yukon valley was the most spectacular and productive; it is commemorated in the name of Dawson city.

Accompanied by R. G. McConnell and J. McEvoy as geological assistants, and W. Ogilvie as surveyor, Dawson left Ottawa by the newly completed Canadian Pacific Railway on April 22, 1887. From Victoria the party travelled by Alaskan mail steamer to Wrangell at the mouth of the Stikine River, arriving on May 18. Via steamer up the Stikine to Telegraph Creek, Dawson took a pack train to the head of Dease Lake, arriving June 5, and finding the lake frozen over. In boats newly made for the trip the party started downstream on June 18, reaching Lower Post at the junction of the Dease and Liard rivers on June 23.

R. G. McConnell left Dawson at Lower Post and started down the canyons and rapids of Liard River as the beginning of his remarkable two-year investigation of the geology and resources of the Mackenzie and Yukon valleys.

Dawson and party ascended the Liard to Frances Lake from which they portaged to the Upper Pelly River, arriving on July 29. Having made a canvas canoe, the party descended the Pelly to the Lewis at the ruins of old Fort Selkirk. Here Ogilvie joined Dawson, having come in from the Lynn Canal over the Coast Range and down the Lewis River, on his two-year topographic survey down the Yukon, over the Divide and up the Mackenzie River. Dawson and party built a wooden boat, ascended the Lewis River, crossed from its headwaters through the mountains by the Chilkoot Pass and reached the coast at the head of Lynn Canal on September 20.

Dawson noted that glacial till was absent at the junction of the Upper Pelly and Yukon rivers, thus discovering the unglaciated area in the Central Yukon including the gold bearing (placer) belt. He states: "It [the Yukon district] is already yielding a considerable yearly product in gold, and presents every indication of a country rich as well in other metals, and including deposits of coal. . . . Late in the autumn of 1886 'Coarse gold' was found on Forty-mile Creek . . . still further down the main river than the Stewart, and the announcement of the fact drew off nearly the entire mining popula-

[3]Dawson's eighty-nine publications start with the Great Plains, 1874–75, after which he spent most of his time in British Columbia and the Yukon Territory.

tion of this place in 1887." Dawson describes finds on the upper part of the Lewis River, the Big Salmon, the Upper Pelly, the Teslin-too, the Stewart, and elsewhere. "The number of miners in the whole Upper Yukon country in 1887 may be stated at about 250; of these, 200 were on Forty-mile Creek."

Dawson's report covers 178 pages; seven Appendices cover 95 pages more. These deal with "Distribution of Trees and Shrubs"; "Notes on Indian Tribes," including a census and short vocabularies; lists of plants; zoology; character of rocks; meteorological observations; and astronomical observations. The topographical and geological surveys of the Yukon and Mackenzie valleys made by Ogilvie and McConnell were far-reaching contributions to the exploration of the region and effective testimony to the ability and endurance of the men who carried them out.

Dr. George M. Dawson's name stands alongside that of Sir William Logan as a founder of Canadian geology.

Dr. A. R. C. Selwyn, President of the Royal Society for 1895–96, has already been referred to in his capacity as Director of the Geological Survey succeeding Sir William Logan.

Sir James A. Grant, M.D., was President of the Royal Society, 1902–03. Sir James was among the last of the prominent amateur geologists (another, G. F. Matthew of St. John, New Brunswick, was a contemporary). Grant was President of Section IV in 1891–92. Sir James' four publications deal with the geology and palaeontology of Ottawa and vicinity and are dated from 1864 to 1883. He was knighted for medical services rendered to Princess Louise, wife of the Marquis of Lorne.

Dr. Frank Dawson Adams (1859–1942) was President of the Royal Society, 1913–14. Born in Montreal, Adams was educated at the Montreal High School, McGill University, Yale, Johns Hopkins, and Heidelberg, from which he received the Ph.D. degree. He joined the staff of the Geological Survey of Canada in 1880; he was appointed by Sir William Dawson as Lecturer in Geology at McGill in 1889 and Logan Professor of Geology in 1893. At McGill, Adams established a graduate faculty; he became Dean of the Faculty of Applied Science, Vice-Principal, and for a time Acting Principal.

Of Adams' ninety publications, his studies of rocks and minerals under extreme heat and pressure and the *Question of the Depth of the Zone of Flow in the Earth's Crust* broke new ground and were of special significance. *The Geology of Ceylon*, based upon field work carried out after his retirement from McGill, was a major contribution. His last publication, *The Birth and Development of Geological Sciences*, following investigations in all the great libraries of Europe and America is a basic contribution to the subject.

In addition to his teaching, field investigations, and administrative work, Dr. Adams was a member of the Conservation Commission and of the National Research Council from its foundation until his retirement from

McGill. Well did his middle name "Dawson" associate him with Sir William and his famous son Dr. George M. Dawson, in the record of geological achievement!

Dr. Arthur Philemon Coleman (1852–1939) was President of the Royal Society, 1920–21. Born at Lachute, Quebec, Coleman was educated at the Collegiate of Cobourg, Ontario, and at Victoria University, then located at Cobourg. He received the B.A. degree from Victoria in 1876 and the M.A. degree in 1880. He received the degree of Doctor of Philosophy from the University of Breslau, Germany, in 1881.

Dr. Coleman was appointed Professor of Geology and Natural History in Victoria University in 1883. In 1891 he became Professor of Assaying and Metallurgy in the School of Practical Science at Toronto. In 1901 he was appointed Professor of Geology and in 1919, Dean of the Faculty of Arts in the University of Toronto, retiring in 1922. Associated with the Bureau of Mines of Ontario from its beginning in 1891, Dr. Coleman was appointed its Geologist and Mineralogist in 1894.

A. P. Coleman's outstanding contributions were on glaciation: his *Ice Ages—Recent and Ancient*, published in 1926 and reprinted in 1929, and another book in preparation at the time of his death, are significant. A veteran mountaineer, his observations were made at first hand, and he was preparing for a trip to South America when he died.

William Arthur Parks (1868–1936) was President of the Royal Society, 1925–26. Born in Hamilton, Ontario, W. A. Parks attended Hamilton and Bowmanville schools, and the University of Toronto, from which he received the degrees B.A., Ph.D., and LL.D. He served the University of Toronto for forty-three years, teaching mineralogy, geology, and palaeontology, latterly as head of the Department of Geology. He retired in 1936 as Professor Emeritus. Parks made valuable contributions to the invertebrate palaeontology of Ontario and collected and described fifteen new species of dinosaurs from Alberta. These he exhibited in the Royal Ontario Museum where he was curator of palaeontology.

Charles Camsell (1876–1958) was President of the Royal Society 1930–31. Born at Fort Liard, Charles Camsell was the son of Captain J. S. Camsell, R.N.A., a Factor of the Hudson's Bay Company, who moved to Fort Simpson when he became Chief Factor of the Mackenzie River District. When eight years old, Camsell travelled with the fur brigade up the Mackenzie, Slave, and Athabasca rivers to McMurray, thence by boat, oxcart, and horse to Prince Albert and Fort Qu'Appelle where he boarded the train for Winnipeg. After attending St. John's College, Camsell entered the University of Manitoba in 1891, receiving his B.A. degree in 1894. He studied at Queen's in 1901, at Harvard in 1902, and at the Massachusetts Institute of Technology in 1908.

Camsell's northern travels included an attempted trip to the Klondike by the Liard and Frances rivers in 1897; a trip through Great Bear Lake towards the Coppermine River as an assistant to James MacIntosh Bell

in 1900. In 1905 he crossed the Yukon-Mackenzie divide and traversed the Wind and Peel rivers in his best-known trip of exploration.

Camsell was appointed to the staff of the Geological Survey of Canada in 1904; in 1914 he became Geologist in Charge of Exploration. He served on the Munitions Board and Canadian Munitions Resources Commission during World War I. In 1918 he opened the branch office of the Geological Survey of Canada in Vancouver and in 1920 he was appointed Deputy Minister of Mines, which later became the Department of Mines, Interior, Immigration, and Indian Affairs. As Commissioner of the Northwest Territories for eleven years this "man of the North" contributed greatly to the development of the land of his birth. He retired in 1948.

Charles Camsell was a recipient of many honours—a Fellow and President of many societies. He was a founder and President of the Canadian Geographical Society, founder and first chairman of the Board of Governors of the Arctic Institute of North America. In 1935 he was made a Companion of the Order of St. Michael and St. George.

Reginald Walter Brock (1874–1935) was elected President of the Royal Society at its meeting at McMaster University in 1935. Born in Perth, Ontario, R. W. Brock matriculated from the Ottawa Collegiate Institute in 1890. He spent two years at the University of Toronto and after missing a year and a half from college due to illness, he entered Queen's University in January, 1894. Here Brock was associated with his friend Willet G. Miller, newly appointed Lecturer in Geology and Mineralogy at the School of Mining, Kingston. In the spring of 1895, Brock graduated with the degree of Master of Arts, taking the medal in mineralogy and tying for the medal in chemistry.

Brock did his early field work, 1891 to 1896, as assistant to the veteran explorer Dr. Robert Bell, in northern Ontario and Quebec. He spent the winters 1895–96 and 1900–01 at Heidelberg, studying under Rosenbusch. Brock lectured in mineralogy at Queen's University 1896–97. In the summer of 1897 Brock started work in British Columbia as assistant to R. G. McConnell, on the West Kootenay map sheet. That autumn he was appointed to the staff of the Geological Survey of Canada and was especially selected by the director, Dr. G. M. Dawson, to continue his work in British Columbia. In 1902 he was appointed Professor of Geology and Petrography at Queen's University.

On November 28, 1907, Brock was appointed Director of the Geological Survey of Canada and Acting Deputy Minister of the Department of Mines. The reconstruction of the Geological Survey and the organization of the Victoria Museum in the new quarters in six and one-half years were most noteworthy accomplishments.

Dr. Robert Bell initiated the practice of employing undergraduate students recommended by the universities as summer assistants. Brock standardized this system. Postgraduate work for geologists was becoming general. Brock made the Ph.D. compulsory for appointment to the rank

of geologist on the G.S.C. and gave liberal leave to those who had not qualified in order that they might complete their standing.

In the spring of 1914 Brock was appointed Deputy Minister of Mines, but in the early summer he resigned to become Dean of the Faculty of Applied Science at the University of British Columbia, then on the drawing boards. Before it had started, war broke out and Brock enlisted in the 22nd Regiment Seaforth Highlanders of Canada, rising to the rank of Major. Even during war duties Brock found time, while intelligence officer under Lord Allenby in Palestine, to study the geology of that region. He also helped establish the Khaki College which was started at Seaford, November 2, 1917.

Returning home, in 1919, Brock built up the Applied Science Faculty of the University of British Columbia and established the course in geological engineering. He also established a course in geography.

The Geological Survey of Hong Kong 1923–33, and the Survey of the Geological Resources of the Pacific Great Eastern Subsidy Lands of B.C. were directed by Brock.

He was killed in an aeroplane accident at Alta Lake, British Columbia, on July 30, 1935.

Brock belonged to many societies and received numerous awards. Queen's granted him the LL.D. degree in 1921, the University of Hong Kong in 1933. In 1935 King George V granted him two Jubilee Medals.

Brock's seventy publications discuss the geology of the Precambrian shield and the complex geology of British Columbia, emphasizing economic geology. His report on the geology of Hong Kong was curtailed by his death.

George Albert Young (1878–1947) was elected President of the Royal Society in 1935, after the death of R. W. Brock. Born in Montreal, G. A. Young graduated from McGill with the degree of B.A.Sc. in 1898 and M.Sc. in 1900. He received the Ph.D. degree, specializing in geology, from Yale in 1904. He joined the Geological Survey of Canada in 1904, was appointed Chief Geologist in 1924 and retired in 1943.

Dr. Young's field work was scattered over Nova Scotia, New Brunswick, Quebec, Ontario, British Columbia, the Belcher Islands, and the Northwest Territories. As editor and later as Chief Geologist, Dr. Young gave constant care to the quality and usefulness of Geological Survey work and the consequent reports.

Robert Charles Wallace was President of the Royal Society, 1940–41. Born in the Orkney Islands of Scotland, June 15, 1881, R. C. Wallace received the M.A. degree from Edinburgh, 1901, the B.Sc., 1907, the D.Sc. 1912, the Ph.D. from Göttingen, 1909.

Essentially a teacher and administrator, Wallace was a Demonstrator at St. Andrews, 1909–10, Lecturer in Geology and Mineralogy at the University of Manitoba, 1910–12, Professor, 1912–28; President of the University of Alberta, 1928–36; Principal of Queen's University, 1936–51. He

was Commissioner of Northern Manitoba, 1918–21, and Commissioner of Mines for Manitoba, 1927–28. His field work and research were concerned with mineralization, rock magmas, petrology of Precambrian rocks, and economic geology. Dr. Wallace lectured and wrote on many subjects; such titles as "The Humanism of Science," "The Integrated Life," and "The Geological Formations and Mineral Resources of Manitoba" suggest the scope of his interests. "By pen and speech he tried to make a better world," said his biographer, W. E. McNeill.

After re-building and re-financing Queen's, Dr. Wallace retired in 1951. He then assumed other duties including Executive Director of the Arctic Institute of North America, Consultant to the Department of Education of Ontario, and Member of the Defence Research Board.

He died January 29, 1955.

The author of over 160 publications, the recipient of 20 honorary degrees, a member or fellow of ten learned societies, Dr. Wallace exemplified the blending of earth science and humanism, represented in greater or lesser degree by preceding Presidents of the Royal Society of Canada.

The three geologists who immediately succeeded R. C. Wallace as Presidents of the Royal Society are living and their work is well known. They are: Dr. Elwood S. Moore (1945–46), Head of the Department of Geology, University of Toronto; Dr. John J. O'Neill (1950–51), Head of the Department of Geology and Dean of Science, McGill University; and Dr. G. S. Hume (1955–56), Director General of Scientific Services, Department of Mines and Technical Surveys, Ottawa.

In addition to the Presidents of the Royal Society there were many other fellows of Section IV who made very special contributions. The following are typical:

Dr. Robert Bell (1841–1917) (President of Section IV, 1887–88) was a great explorer in northern Quebec, Ontario, and Hudson Bay. He was acting Director of the Geological Survey from the death of Dr. Dawson in 1901 until the appointment of A. P. Low in 1906.

J. F. Whiteaves (1835–1909) (President of Section IV, 1892–93) continued the contributions to palaeontology started by Elkanah Billings and laid a firm foundation in Canada for this important branch of geology.

Joseph Burr Tyrrell (1858–1957) (President of Section IV, 1915–16) graduated from the University of Toronto in 1880 and the following year joined the Geological Survey of Canada under the directorship of Dr. Selwyn. Starting work under G. M. Dawson, Tyrrell crossed the Rocky Mountains through four different passes. He discovered dinosaur remains in the Red Deer valley and in 1893 he verified a seepage of oil near Morinville, Alberta. Tyrrell mapped twenty-five thousand square miles of unexplored land around Lake Winnipeg; made two memorable trips down the Dubawnt and Kazen rivers to Chesterfield Inlet and Hudson Bay, involving four-hundred-mile canoe journeys around Hudson Bay and nine-hundred-mile journeys on snowshoes to Winnipeg and Norway House.

In 1898 Tyrrell worked in the southwestern Yukon and visited the Klondike gold fields. Later he started consulting and placer-mining in the Klondike, eventually moving to Toronto. In 1925 he was appointed President of the Kirkland Lake Gold Mining Company, holding that position until 1954.

Tyrrell's *Journals of Samuel Hearne, Philip Turnor, David Thompson,* and *Documents Relating to the Early History of Hudson Bay,* were published by the Champlain Society. A member of many societies, and recipient of various decorations he is well known for his donation to the Royal Society of the Tyrrell Medal.

Richard George McConnell (1857–1942) (President of Section IV, 1917–18) and his association with Dawson's northern explorations have been mentioned. His work on the Great Plains, in various parts of British Columbia, and late in life in Ontario, justifies a statement made by Charles Camsell that "McConnell was the greatest exploring geologist that Canada ever had." McConnell was a member of the Geological Survey, 1880–1914, and Deputy Minister of Mines, 1914–21. After retiring he continued work for the Ontario Department of Mines.

Eugene Rodolphe Faribault (1866–1953) (President of Section IV, 1922–23) was a graduate of Laval, C.E., 1890; B.A.Sc., 1898; D.Sc., 1921. Faribault assisted Hugh Fletcher in northern Nova Scotia during the summers of 1882–84 and in 1885 was appointed to the staff of the Geological Survey of Canada by A.R.C. Selwyn. His life's work centred in mapping and describing the gold fields of Nova Scotia, an area 275 miles long and 10 to 40 miles wide.[4]

Dr. Faribault was a member of many learned societies including the Geological Society of Belgium. He represented Laval University at the Paris Universal Exposition in 1889, and the Canadian Government at the Columbian Exposition of 1893 and at the Paris International Exposition of 1900. In 1926 he represented the Geological Survey of Canada at the International Geological Congress in Madrid.

"Although he worked with the tools of a young and undeveloped science, his results will stand for many years, and he will always be known as the Grand Old Man of Nova Scotian Geology."[5]

William Henry Collins (1878–1937) (President of Section IV, 1923–24) was a graduate of the University of Toronto, 1904, and studied at Heidelberg, Chicago, and Wisconsin, receiving the Doctor of Philosophy degree from the last in 1911. Appointed to the staff of the Geological Survey in 1905, Collins started his life study of the Precambrian of northern Ontario, his thoroughness soon making him an authority. Collins was appointed Director of the Geological Survey in 1920 and Acting Director of the

[4]W. Malcolm, *Gold Fields of Nova Scotia,* compiled largely from the results of investigations by E. R. Faribault (G.S.C. Memoir 156; Ottawa, 1929).

[5]Ludlow J. Weeks, in *Proceedings of the Royal Society of Canada* (Ottawa, 1954), p. 73.

National Museum in 1926. He represented Canada at the Fifteenth International Geological Congress held in South Africa in 1928 and the Sixteenth held in the United States in 1933.

Donaldson Bogart Dowling (1858–1925) was elected a fellow of the Royal Society in 1912. He was honorary Librarian from 1913 until the time of his death and was elected vice-president of Section IV in 1925. Dowling gained the degree of B.Sc. McGill, 1883, and joined the G.S.C. in 1884. His field work in northern and western Canada led him to specialize in coal and petroleum. He was widely known as an editor of the *Coal Resources of the World* issued in 1913 by the Twelfth International Geological Congress. In 1921 McGill conferred on him an honorary degree of Doctor of Science.

A fine artist, Dowling worked to maintain high standards in the publications of the G.S.C. He was also largely responsible for the separation of old Section IV of the Royal Society into two sections, the geological sciences and the biological sciences, which took place in 1918.

Two eminent women are members of Section IV:

Alice E. Wilson, M.B.E., Ph.D., was elected a fellow in 1938. Her excellent work on the Ottawa sheet and her widespread palaeontological studies were the outcome of her many years service on the Geological Survey of Canada.

Madeleine A. Fritz, M.A., Ph.D., Professor of Geological Sciences, University of Toronto, was elected a fellow in 1942. Her work on fossil bryozoa is outstanding.

Specialized branches of earth sciences have been recognized by Section IV. Geography, recognized so early by the University of New Brunswick and later dropped, was taught in the French-speaking colleges of Quebec but was generally overlooked by the English-speaking universities until R. W. Brock introduced physical geography as the beginning course for students taking geology at the University of British Columbia when it opened in 1915. As Brock was already in the Army, the course was given by Dr. S. J. Schofield (F.R.S.C., 1922). In 1920 a course in weather and climate was added and in 1923 the name of the department was changed to geology and geography.

Geography gradually broadened at the University of British Columbia, becoming a separate department in 1959. It now has two Professors, one Associate Professor, two Assistant Professors, one Instructor, and five Lecturers. Professor J. Ross Mackay was elected a fellow of Section IV in 1959.

In 1935 the University of Toronto established a chair of geography, Dr. Griffith Taylor being made Professor. He was elected a fellow of Section IV in 1942.

Other universities have established chairs and lectureships, for example, Western in 1938; McMaster in 1939, raised to a separate department in 1942; McGill, a department in 1945; University of Montreal with graduate

courses in 1947; Queen's, 1960. Other colleges bring the total number with established courses in geography to seventeen.

Other earth sciences are now represented; Dr. George D. Garland, Associate Professor of Geophysics, University of Alberta, elected 1959; Dr. R. M. Hardy, Research Professor of Civil Engineering, University of Alberta, elected 1958; Dr. John H. Hodgson, Chief, Division of Seismology, Dominion Observatory, Ottawa, elected 1958; Dr. J. A. Jacobs, Professor of Geophysics, University of British Columbia, elected 1958; R. F. Legget, Director, Division of Building Research, National Research Council, Ottawa, elected 1956; Dr. V. K. Prest, Chief, Pleistocene, Engineering and Ground-Water Section, G.S.C., Ottawa, elected 1960; Dr. J. W. Watson, Professor of Geography, Edinburgh University, elected 1953; Dr. J. Tuzo Wilson, Professor of Geophysics, University of Toronto, elected 1948.

The fellows mentioned may be taken as representative not only of their associates in Section IV, but of many workers in universities, government agencies, mines, oil fields, and other commercial organizations. Their records show them to be truly humanistic in outlook. Recognition of the worth of such men and women by the Royal Society of Canada has been a contribution to scientific and national development.

APPENDIX B

PRESIDENTIAL ADDRESSES OF THE SECTIONS

The Presidential Address for Section III has been printed with the Tory Medal Address on a related subject in the *Transactions of the Royal Society of Canada, Section III*. Manuscripts were not prepared for the Presidential Addresses for Sections I and V. Owing to illness, Father Phelan was unable to prepare his Presidential Address for Section II in 1960 and it therefore appears here.

PROCEEDINGS OF THE ROYAL SOCIETY OF CANADA
VOLUME LV : SERIES III : JUNE, 1961

SECTION II: PRESIDENTIAL ADDRESS FOR 1961

Our Changing Constitution

F. R. SCOTT

IN a presidential address before this Section of the Royal Society, whose members are drawn from so many different fields of knowledge, one is tempted to choose a subject that can be treated in a manner less technical than would be expected by a more specialized audience. This paper is about our changing constitution, but from a point of view broad enough, I hope, to cut across many of the boundaries that divide us. I have selected for discussion certain aspects of our constitutional development that are particularly relevant to problems we face today, the most important of which is the "repatriation" of the constitution itself. Part of my paper—indeed much of it—will be historical, a reminder of things past, even a *recherche de la constitution perdue*; part will be autobiographical; and part of it will be rash enough to include foretellings, and perhaps forebodings, of the future. As I shall frequently refer back to a date of which we shall shortly be celebrating the centenary, namely 1867, the first all-Canadian year, I feel that a short title to my talk might simply be "Life with Fathers."

I had the good fortune, as a young student in the McGill Law Faculty, to be introduced to constitutional law by the late H. A. Smith, until recently Professor of International Law at London University. He was not only a stimulating teacher but a jurist with a strong sense of history, who looked through the legal terminology of the constitution, and of its judicial interpretations, to the body politic it was designed to create. It was he who taught me to see the problems which the Act of 1867 was intended to remedy, to look at the conditions in the British North American colonies in the 1860's, and to seek the intentions of the Fathers of Confederation not only in the words of the statutes but also in all the material available to historians, including the Confederation debates and other *travaux préparatoires*. He was well aware that English and Canadian courts exclude references to most of this material, and he has strongly urged[1] that this rule of exclusion should be changed to the more sensible practice, well established in continental jurisdictions, of permitting the judges to admit all historical evidence and to use their own discretion in respect of it.

[1]"Interpretation in English and Continental Law," *J. Comp. Leg.*, Third Series, vol. IX (1927), p. 153. See also "The Residue of Power in Canada," 1926 Can. Bar Rev., 432 at p. 433.

Professor Smith was among the first commentators in Canada to point out that the trend in Privy Council interpretations of the B.N.A. Act—he was writing just after the disastrous judgment of 1925 in the Snider case had reduced federal jurisdiction to its lowest point—had been towards a type of constitution quite different from that which the Fathers of Confederation had clearly intended. To use his own words: "Whether the principle of federal government devised by our forefathers or that more recently established by the Privy Council is the better for Canada is a question of policy beyond the scope of this article. I hope that I have written enough to show that they are not the same."[2]

The Fathers had stressed the importance of the federal government's being given ample authority for the great task of nation-building[3] that was entrusted to it. Unlike the American Congress, the Parliament of Canada possessed the residue of powers not otherwise distributed, as well as its specified powers. The Privy Council, in certain leading cases, had paid so much attention to the preservation of provincial autonomy, as though this was the chief or only aim of the Fathers, and had so expanded provincial jurisdiction over property and civil rights, as virtually to transfer the federal residuary power to provincial hands, at least in peacetime. Apart from the residuary clause, Privy Council judgments drastically curtailed federal jurisdiction over trade and commerce, fisheries and agriculture. Such a *volte face* could only have occurred in a court which substituted its own idea of the intentions of the Fathers from that which was on the record it barred itself from examining.

Professor Smith's thesis took some time to win acceptance in legal and academic circles. The historical record, it is true, was not wholly clear, either before or after 1925. A change of heart seemed to occur when the Privy Council in the years 1930–32 attributed to federal competence two matters of national and indeed international importance, namely aeronautics and broadcasting,[4] but this was a short-lived respite. After the judicial massacre of Mr. Bennett's "New Deal," legislation in 1937,[5] weakening if not destroying federal competence over unemployment insurance, interprovincial marketing, and the implementing of Canadian treaties, there were few commentators left in Canada who had not put themselves on record as sharing Professor Smith's point of view.[6] Instead of being "a living tree capable of growth and expansion," as the constitution was described in 1930, it was now likened to a ship of state sailing on larger ventures but still retaining the "watertight compartments" which were an essential part of her original

[2]"The Residue of Power in Canada," 1926 *Can. Bar Rev.* 432 at p. 439.

[3]Cartier, Brown, Galt, and other Fathers of Confederation used the words "nation" to represent all Canada. See references in F. R. Scott, "Political Nationalism and Confederation," *C.J.E.P.S.*, VIII, 3 (1942), pp. 387–90.

[4]Both judgments are reported in 1932 A.C., pp. 54 and 304 ff.

[5]See the Appeal Cases for that year; also comments in 1937 *Can. Bar Rev.*, pp. 393–507.

[6]I have compiled a list of these authorities in "Centralisation and Decentralisation in Canadian Federalism," 1951 *Can. Bar Rev.*, p. 1095 at p. 1108 n. 44.

structure. So, as Professor McWhinney points out,[7] the "marine metaphor" of Lord Atkin offsets the "arboreal metaphor" of Lord Sankey. The Sirois Report in 1940, perhaps not wanting to wound provincial susceptibilities, came to the remarkable conclusion that the historical interpretation and references to the intentions of the Fathers of Confederation proved nothing, and that anyway the enquiry was not worth pursuing.[8] The enquiry, in my opinion, was very well worth pursuing and is still more worth pursuing as we come to face the problem of nationalizing the constitution. In turning our back on history we may forget values and experiences which are still valid.

I think perhaps in this debate, now almost forgotten but having a relevance I shall attempt to show in a moment, there were some important considerations overlooked. A constitution establishes a structure and framework for a country based on certain values. If, like ours, it is largely a written constitution for a federal state, it is a law for making laws, looking to the future exercise of the powers distributed for the attainment of the desired ends. The value of the historical approach is not that it necessarily settles the points of contention that the courts must wrestle with, or that it renders more precise the meaning of words and expressions whose ambiguities are only brought to light by experience, though it sometimes may help even here. The value is rather in the broad objectives it discloses, the political concepts shown to have gone into the making of the constitution, which point in the general direction that the courts would be expected to follow.

The great constitutional values that the Fathers of Confederation considered important cannot easily be disputed. Those men valued provincial autonomy, of course, or there would not have been a federal state. But they equally clearly valued a federalism that leaned towards strength at the centre when the choice had to be made, or they would not have placed the residue of powers in federal hands, unified the court structure, and provided for federal appointment of Lieutenant-Governors and disallowance of provincial laws. They held the duality of cultures to be a value; they wanted protection for certain school and language rights. The two cultures, moreover, were to enjoy equal status in the Province of Quebec, despite the numerical superiority of the French-speaking element there. They clearly intended Canada to possess a system of parliamentary democracy, for the whole Act, as well as the Preamble, contemplates the free working of parliamentary institutions with all that that implies in the way of fundamental liberties. And that the new federal government was to be the chief builder of the national economy, having the main responsibility for our future material well being, is abundantly evident from all that was said at the time as well as in the provisions of the Act relating to economic matters. In the words of Dr. Macintosh, speaking of the Fathers of Confederation:

[7] *Judicial Review in the English-Speaking World* (2nd ed.; Toronto, 1960), p. 74.
[8] *Report of the Royal Commission on Dominion-Provincial Relations* (Ottawa, 1940), vol. I, pp. 32–6.

"They had conceived a great and daring project: the development of interprovincial trade, the acquisition of the West from the Hudson's Bay Company, the construction of a transcontinental railway and the administration of a scheme of immigration and land settlement."[9] It is in the light of these values and objectives that the main criticism of the constitutional commentators was directed at the results of so much of the judicial interpretation.

Among French-speaking lawyers and jurists the study of constitutional law has, quite naturally perhaps, been accorded less time and received less attention than the broad field of the civil law, Quebec's proud and exclusive possession. The aspects of the constitution which most occupied French Canada until comparatively recently were those dealing with language and school rights, and with Canada's status in the Empire and Commonwealth. Under the powerful and colourful leadership of Premier Duplessis, however, and emerging from the extreme centralization of World War II, ardent defenders of Quebec's autonomy discovered their provincial government as a potent symbol (with a flag) and protector of their rights and revendications. The full value of certain Privy Council trends in interpretation came to be appreciated, though the developing opinion did not stop there. When Quebec's Royal Commission of Enquiry on Constitutional Problems in 1956 did make the kind of political, social, and economic analysis of the constitution to which English-speaking Canadians had been more habituated, it produced, in both French and English, the five weighty volumes of its Report that we call the Tremblay Report.[10] Though little known, I suspect, outside Quebec, and perhaps confined to certain circles inside, this Report is in my opinion as important reading for serious students of our constitution as any other work we possess—at least if you believe, as I do, that thoughts in people's heads are potent forces making for constitutional change.

Like the Sirois Report, to which it is in effect a point by point reply, the Tremblay Report crystallizes a certain attitude of certain people at a certain time, and also like the Sirois Report, its recommendations are not all going to be accepted. It puts forward a view of Canadian federalism based (if I may be forgiven an over-simplification) upon the treaty-between-races concept, the notion that the constitution is primarily designed to preserve and promote the duality of cultures. Note that this concept is not the same as the concept of provincial autonomy, since the notion of cultural partnership does not favour any province except Quebec. From the treaty concept, however, conclusions are drawn which would require a relinquishment of federal control and jurisdiction far greater than any to be hinted at even in Privy Council judgments and such as would have astounded the

[9] In *Federalism: An Australian Jubilee Study*, ed. Geoffrey Sawer (Melbourne, 1952), pp. 87–8.

[10] *Report of the Royal Commission of Inquiry on Constitutional Problems* (Quebec: Queen's Printer, 1956), and Annexes.

Fathers of Confederation. The duality of cultures was, as I have said, one of the values, and a great value, accepted at Confederation, but then it was not believed to be incompatible with the other values also affirmed at the time, one of which was that our federalism should be strong at the centre rather than weak. The Tremblay Report is one possible view, if not of what Canadian federalism is (though in some degree this claim is made), but of what it ought to be; it touches on matters which are so much a part of our national life as never to be far from our political choices; and it adds a number of challenging ideas to that total stream of thought and discussion in Canada, whose variety of claims and whose contradictions make our constitutional history and law so interesting.

I know it sounds a little old-fashioned still to be talking about the Fathers of Confederation and the kind of country they foresaw. The choices they made are not necessarily the best for today. But it seems to me both interesting and relevant to know why they made them, so that if we decide to reject or alter their scale of values, we do so deliberately and consciously. We seem to be facing constitutional issues comparable, in some ways, to theirs. We are certainly having to think out our relationship with the United States afresh. Canada in the 1860's received the opposite treatment from that which is now accorded us: instead of seducing us by the embrace of great corporations, which has brought so many of us to bed with affluence, the Americans then cast our forefathers out into the economic wilderness by cancelling the Reciprocity Treaty, just as England had earlier rejected them by repealing the corn laws. So there we were in the 1860's, English- and French-speaking Canadians, Maritimers and distant western colonials, having to meet the challenge of continental isolation with boldness and imagination, or else to remain in a petty provincialism exposed to all the dangers of stagnation and ultimate absorption.

I am still impressed, every time I reflect upon it, with the largeness of outlook of the men who believed, though they had only the simplest and slowest means of communication with remote parts of a vast country, that they could make of the bigger northern half of the continent something like what the Americans had made of the southern half so far as economic development was concerned. At that time the prime mover in the whole business had to be the new government at Ottawa; provinces were necessary for the preservation of local customs and institutions, and had their guaranteed rights, but they could not be the chief builders of the new federal state. Many of the leading Fathers of Confederation, particularly in central Canada, moved out of the provincial sphere into the new national sphere because the opportunities there were larger and the outlook more exciting. Even Joseph Howe ended rather ingloriously in Ottawa, and though he supported the idea at first, confederation knew no more formidable opponent. All this took place without anyone's imagining that it jeopardized the separate schools in Quebec and Ontario, the language rights, or the Quebec Civil Code, all of which were established and accepted at the time

the B.N.A. Act became law. Federal and provincial governments were not thought of as competing units, almost sworn enemies, but as complementary institutions all engaged in their allotted tasks for the benefit of the whole people of Canada. Within the wide boundaries of legitimate provincial autonomy there was thought to be ample room for cultural freedom.

It would take too long to trace here the fading of this early Canadian dream towards the end of the nineteenth century. The prolonged economic depression that began in 1873 seemed to prove the failure of the national economic policies,[11] and increasing tension between races was caused by conflicts over schools and language. What a difference it would have made in Canada if the Privy Council had not overruled the unanimous decision of the Supreme Court setting aside the Manitoba School Laws of 1890.[12] We would have avoided the intense bitterness of the racial feeling that preceded the 1896 election. French Canada felt that on the first great test of her rights the B.N.A. Act had failed her. It was of course London, not Ottawa that failed her. These various influences resulted in a great increase in provincial autonomy at the close of the century. The interprovincial conference of 1887 was the first expression of provincial revolt against federal dominance. It is remarkable how many of the specific requests for constitutional change then made have since been accorded the provinces, chiefly by judicial interpretation.[13] The great western boom in the decade before World War I brought a revival of federal prestige, seeming to justify the expenditures in railway building, immigration, and land settlement, and the war years 1914–18 added to federal importance by the requirements of national policy and by bringing Canada out into the international arena. But these years also widened the racial gap by reason of the school language issue in Ontario and the conscription issue of 1917, and the centralized emergency powers were swiftly dissipated by constitutional interpretation after the war.

Canada was a very divided country during the 1920's, and men of my generation will remember how much the theme of national unity was the object of our discussion and thought in that decade. Though we may not have seen it clearly at the time, new economic factors were increasing the centrifugal forces in Canada and enlarging provincial authority, for the economic expansion was now, not in railways and land settlement, primarily a federal responsibility, but in developing provincial resources by private capital with the consent of provincial governments. Pulp and paper, lumber, base metals, hydro-electric power, opened new fields for investment, most of it private, much of it American. The era of great corporate expansion had begun. In the law courts, the federal government saw its first important effort at economic regulation, its 1919 Board of Commerce Act and its Com-

[11] *Report of the Royal Commission on Dominion-Provincial Relations*, vol. I, p. 50.

[12] *Winnipeg* v. *Barrett*, 1892 A.C. 445.

[13] I have listed these in *Evolving Canadian Federalism*, ed. A. R. M. Lower, F. R. Scott, *et al.* (Durham: Duke University Press, 1958), pp. 69–70.

bines and Fair Prices Act, struck down,[14] and then lost its jurisdiction over labour relations except for a small number of federal undertakings.[15] The way was cleared for an almost unlimited exploitation of Canadian resources by U.S. capital with the assurance of a minimum of governmental control—far less, certainly, than the same capital would have had to face in the United States itself, where the Inter-State Commerce Commission, the Federal Trade Commission, and the anti-trust laws were in effect.

When the great depression of the 1930's converted even the Conservatives into New Dealers, the federal government made another effort at economic leadership, only to meet a second defeat in the law courts. The Natural Products Marketing Act, the Employment and Social Insurance Act, and the three statutes providing minimum wages, maximum hours, and a weekly day of rest were all held unconstitutional.[16] "The economic needs of the nation" have had little relevance to our constitutional law, though they have every relevance to our daily lives, our level of employment, and our standard of living.

So far this account may be leaving the impression that the economic situation ought to be much worse in Canada than in fact it is. How have we enjoyed the post World War II prosperity, such as it was? There are two constitutional answers to this; I do not attempt to give economic ones. One is that we did do something about the constitution: we amended it twice so as to give the federal government the power to enact unemployment insurance and old age pension laws. This established Ottawa firmly in the field of social security and added to its freedom in fiscal policy. In the light of present conditions we can see more clearly that while these forms of welfare legislation provide cushions to ease the shock of economic decline, they do not prevent that decline. Some more positive forms of economic leadership and control are going to be necessary unless we want to fold our hands and watch the current hardships, the regional declines, and the growing injustices with total indifference. Something else besides amendment to the B.N.A. Act took place, however, without formal constitutional change but with even greater constitutional significance. This was the growing use of monetary policy, taxation, and planned government spending, as factors in maintaining economic equilibrium. From the time of its economic proposals in 1945, the federal government became committed to a policy of high and stable levels of income and employment. Keynes became a kind of post-natal Father of Confederation.

The emergence of fiscal and monetary policy as economic regulators has become so important a factor today as almost to make us forget the question of legislative jurisdiction. It seems to have by-passed Sections 91 and 92 of the B.N.A. Act. The lawyers are moving out and the economists are moving in. Since Ottawa has the most money, and exclusive control of

[14] *In re* Board of Commerce Act, 1922 1 A.C. 191.
[15] *Toronto Electric Commissioners* v. *Snider*, 1925 A.C. 396.
[16] These decisions are all reported in 1937 A.C., pp. 326–418.

banking and currency, this fiscal approach restores federal influence in the total governmental picture though no new judgments are forthcoming from the courts to enlarge federal jurisdiction. Ottawa learns to induce where it cannot command, and federal policy is made by bargains with provincial governments. The economic system of course goes on its own way quite apart from this spending power, though greatly affected by it.

Perhaps before handing over entirely to the economists at this point I may be allowed to keep my foot in the constitutional door for a moment longer. The federal spending power has not gone altogether unchallenged. Indeed, the Tremblay Report challenges it directly as being a violation of the federal principle, especially when the spending is for welfare and educational projects. If the authors of the Tremblay Report had their way, Ottawa would move out of unemployment insurance, old age pensions, family allowances, university and research grants, health insurance, and any other forms of direct subsidy for national welfare or cultural expression. This would indeed be a vast change in our constitutional behaviour. Professor Corry has remarked that it is strange that no one has challenged the spending power in the courts, though he admits it is not likely to be denied at this stage.[17] Actually the Family Allowance Act was challenged on one occasion and was upheld by one judge in the Exchequer Court.[18] The refusal of Quebec universities to take federal grants was a challenge to the spending power, though of a somewhat uncertain kind since these universities first accepted them and then, under what I am convinced was external pressure and not a genuine academic decision, changed their minds.[19]

I wish to put myself on record again as of the opinion that the prerogative right of the Crown to make gifts of any money it possesses is unimpaired in Canada, whether it be the federal Crown or the provincial Crown—assuming, of course, that the legislature votes the appropriation. The reason (stated without argument) is that both aspects of the Crown may dispose gratuitously of their own moneys as they see fit.[20] The first of the federal enumerated powers in the Act of 1867 is the exclusive jurisdiction over the "Public Debt and Property," and money in the Consolidated Revenue

[17]In *Evolving Canadian Federalism*, p. 119.

[18]*Angers* v. *Minister of National Revenue*, 1957 Ex. C.R. 83.

[19]See *Survey of Higher Education, 1952–54* (Dominion Bureau of Statistics, 1957), pp. 9–12, for a brief history of Federal Government University Grants. Premier Lesage, when saying that Quebec universities were free to receive Canada Council grants for buildings, explained that they had failed to obtain them in the past only because of a "caprice" of the former National Union government. See *Montreal Star*, June 1, 1961. The N.C.C.U., of which Quebec universities are members, asked the Massey Commission for *per capita* grants for all students registered in professional faculties, and at its meeting in 1951 passed a unanimous Resolution approving the recommendations of the Massey Report. See *Proceedings of the National Council of Canadian Universities 1951*, p. 73.

[20]Mr. Barrette when Premier of Quebec shared this view. When asked why he made gifts to educational institutions outside Quebec, he replied, "La province peut faire un don aussi bien qu'un individu" (See *Le Devoir*, April 9, 1960). It is interesting to note that the first Legislature in Quebec in 1868 appropriated $4,000 for "Aid to Distressed Seamen in Nova Scotia." A nice example of the spending power. (See 31 Vict. (Que.) Cap. I, p. 10.)

Fund is public property. So I believe the federal Crown may decide to invest money in a new industry, like Polymer Corporation, or to subsidize an old one like the coal industry in Nova Scotia, or to buy all butter offered to it at *x* cents a pound, or to build a War Memorial in France, or a dam in India, or to purchase Old Masters for the National Gallery. It is difficult to see how this country could be governed if this power were to be denied; though this is not the same as saying that every government expenditure is a good one or a wise one. By the same spending power a province may open an office in London or New York, contribute to a *Maison Canadienne* in Paris (though it can only make laws "within the province" according to the wording of the B.N.A. Act), may send students abroad on scholarships, may make gifts of food or money to victims of famine in foreign lands, or may even, as is the case in Quebec, give provincial taxpayers' money to a few selected universities in other provinces.

And while I am in this vein, may I add a word about the concept of welfare in our constitution. There are so many vested interests fighting any extension of public welfare expenditure in Canada, and so much advertising and propaganda against it, that we are in danger of being brainwashed into believing that welfare is an evil word. There can be argument about the quantity and forms of welfare, but it cannot be denied that to serve the public welfare is a proper function of all governments in a democratic state. Not just the provincial, not just the federal, but federal, provincial, and local governments have this duty. Every state worthy of being called free, as well as some that are not, is a form of welfare state today. The Fathers of Confederation were very familiar with the word welfare: both in the Quebec Resolutions and in the London Resolutions the residuary power of the federal parliament was expressed as a power to make laws for the peace, *welfare*, and good government of the provinces. "Peace, welfare and good government" are the operative words conferring all jurisdiction to the Legislature in the Act of Union, 1840. No doubt the word had a less inclusive meaning then than now, as had many other words in the constitution, but today's concepts are a logical extension of earlier ones. The Consolidated Statutes of the Province of Canada, 1859, contained laws on Public Health, Innoculation and Vaccination, Emigrants and Quarantine, Charitable and Provident Associations, Private Lunatic Asylums; all these applied to both Upper and Lower Canada, and were over and above the local laws on welfare matters in the two sections of the Province.

Some unknown draftsman changed "welfare" into "order" in the B.N.A. Act, so the Section now reads "Peace, Order, and Good Government," but the word was not taken out of the Preamble of the constitution, which still reminds us that "such a Union," that is, a federal Union under the Crown, "would conduce to the welfare of the provinces." Welfare was to be the result of union: how then is the government of the Union not concerned with it? Of course it must be a concern with welfare that is of a different order from that exclusively reserved to provinces, but the federal entry into

the field, unless there is a transfer of jurisdiction, leaves provincial jurisdiction intact. The problem of cost is another matter, a practical matter involving concepts of equity, balance, and fair treatment, and particularly bringing to light the important function of Parliament in minimizing the discrepancies in our regional incomes. But this belongs to the politics of federalism more than to the law. That it requires a more co-operative kind of federalism than we have had in the past, and more instruments of co-operation, there can be no doubt. Federal–provincial conferences seem here to stay, and they are likely to play a part in our evolution to which there is no real parallel in United States constitutional behaviour. Let us remember, however, that rightly considered every parliament of Canada is also, in a sense, a federal-provincial conference, since its members represent all sections of the country. The provinces of Canada have two governmental voices, not just one, and Ottawa speaks for Quebec, Ontario, and the rest on all matters within federal competence.

Let us come back to this question of jurisdiction. Some things cannot be done by federal–provincial conferences. They can only be done by federal legislation that is national in scope. There is no escape from this, however much it smacks of centralization. It is just another way of saying that freedom of action for the central government is just as important in a federal state as freedom of action for the component parts. Indeed, in a world moving towards integration, in many respects it is more important. Either certain things are done by an authority with larger jurisdiction than that conferred on provinces, or they are not done at all. The command of the law must bear some relationship to the size of the problems sought to be regulated. We have met this difficulty on the municipal level, where metropolitan government becomes impossible if left to a multitude of separate local municipalities. We have met it on the international level, where state sovereignty continues to hamper efforts at regional and world government. We still find it, and I suppose always shall find it, on the national level.

The point will become clearer if I give some examples of existing deficiencies in the federal power. Canada's capacity to enter into treaty relationships with other states is wholly inadequate to the needs of today. The damaging effect of the I.L.O. Conventions case,[21] which in effect overruled the more liberal interpretation of the Privy Council in the Radio case,[22] have not been overcome. Every time Canada abstains from participating in multilateral conventions aimed at achieving good international standards, because of lack of jurisdiction to implement them, she withholds her influence for peace and co-operation. In internal matters, there is a lack of federal jurisdiction in the fields of marketing legislation, and control of the sale of corporation securities. Provincial jurisdiction over industrial disputes is quite incapable of regulating the situations which can arise when nation-

[21] 1937 A.C. 326.
[22] 1932 A.C. 304.

wide employers are dealing with nation-wide unions.[23] Many important aspects of trade and commerce, affecting all provinces, have been held to fall into the provincial jurisdiction over property and civil rights. If we should attempt to exert a wider control over the national economy in peacetime the jurisdictional gaps would become very evident.[24] And there is no ultimate power in Canada to amend the constitution itself.

These realities we must keep before us. Adaptation of the present constitution might come, in part, from judicial interpretation, but this is a lengthy and unsure process. We are confronted again with the need for constitutional amendment. Even if no specific amendments are now being sought, an amendment to give ourselves a complete amending procedure must be secured, or Canada remains in an equivocal position. This is what "repatriation" means in legal terms.

This brings me to my final point. We are now in the process of holding federal–provincial conferences of Attorneys-General, to seek this all-embracing amending formula and the "repatriation" of the constitution. We have to transfer to Canadian legislatures the last vestiges of sovereignty over Canada still remaining in the United Kingdom. When this is done, some body or bodies in Canada will alone make all constitutional changes. But how? This is where we have always failed in the past. Just eleven years ago I read my first paper to this Section of the Society on the topic: "The Redistribution of Imperial Sovereignty." Since then that redistribution has accelerated, and the Mother of Parliaments has been "signing off" its authority over new state after new state. Canada has been left out of this process because we could not agree on the terms on which we would take our freedom. We are like Mr. Melpomenous Jones in Leacock's story, who never could make up his mind to say good-bye; finally after visiting some friends for dinner and being kept on as a house-guest for weeks, he acquired a fatal fever and departed this life murmuring "I think I must go now."

What is happening at the Attorneys-General Conference is mostly confidential and cannot be discussed here. This is itself a fact of some importance. It is our country and our future that is being planned and we—the citizens —should have our chance to be heard at the appropriate time before our governments have taken up fixed positions. Not being able to enlarge upon the suggestions now being considered, I shall content myself with bringing this paper to a conclusion by summarizing my ideas in the form of a series of propositions.

(1) The Canadian constitution has not yet recovered from the damaging effects of judicial interpretation in the past. The argument for flexibility in the amending procedure is therefore particularly strong provided it can be

[23]See F. R. Scott, "Federal Jurisdiction over Labour Relations—A New Look," *McGill Law Journal* (1960), p. 153.

[24]Some of these are discussed in F. R. Scott, "Social Planning and Federalism" in *Social Purpose for Canada*, ed. Michael Oliver (University of Toronto Press, 1961).

achieved without endangering the cultural partnership which is fundamental to our federalism. If we freeze the present distribution of powers the federal government could be gravely hampered in dealing with future problems.

(2) Canada is facing constitutional choices comparable in their importance and their future implications to those which were made a hundred years ago by the Fathers of Confederation. They established a federal system: we must now define its nature.

(3) The "repatriation" of the constitution involves replacing the theory of the legal sovereignty of the United Kingdom Parliament, on which the B.N.A. Act now rests, with a new theory. The amending clause will imply that theory.

(4) The crux of the problem lies in the degree of provincial consent necessary to effect a transfer of legislative jurisdiction as between Parliament and Legislatures. The compact theory of Confederation, now seemingly uppermost in the present discussions, would require the unanimous consent of provinces for any such change. Such rigidity would I think be fatal to Canadian federalism. The treaty-between-races theory is somewhat more flexible, since it would require the consent of Quebec but not necessarily of all the other provinces. A theory that balanced the need for cultural guarantees with the need for constitutional adaptation to the rapidly changing conditions of the modern world would entrench minority rights without entrenching all other provincial powers in their present form—least of all the whole of "property and civil rights" as those words are presently defined by the courts.

(5) Before 1867 it took at least a decade of conferences and discussions before a constitutional solution was found acceptable to a majority of Upper and Lower Canadians and Maritimers. While a decade has passed since the last Federal-Provincial Constitutional Conference of 1950, the interval has been marked, not by intensive discussion, but by the absence of discussion.

(6) The nation today is not prepared for the choices it seems to be on the point of making. Any final decisions should be delayed until much wider groups of people have been brought into the picture and invited to participate in the formulation of an amending procedure appropriate to our traditions, our experience, and our present needs.

(7) While the present position of Canada *vis-à-vis* the United Kingdom is equivocal and obviously temporary, the dangers of delay in terminating it are far less than the dangers of too hasty an acceptance of "repatriation" at any price.

(8) The continuation of the reserve constituent powers of the United Kingdom Parliament in the amending of the Canadian constitution is no more a limitation on Canadian sovereignty than is the continuation of the position of the Crown in respect of Canada. In both instances the political control of the exercise of the United Kingdom legal powers is in the hands of Canadians. The Crown acts only on the advice of its Canadian ministers,

and the United Kingdom Parliament acts only on the advice of the Canadian Parliament.

(9) Future conferences on repatriation should include representatives of opposition parties as well as representatives of parties in power. The constitution is for all Canadians and not just for present governments.

Canada is built on a series of paradoxes. East–west versus north–south pulls, central power versus provincial autonomy, economic integration versus cultural dualism—one could extend the list of opposites which must be harmonized and accommodated if we are to remain as a single nation-state in a changing world. Other solutions could be found to the one which the Fathers of Confederation, backed by a majority of the peoples of Canada of both races at the time, chose and thought to be viable. Nationalism is a force as powerful today as ever in the history of mankind, and nationalism in Canada is again a paradox, perhaps the greatest paradox, because it is not a single but a dual nationalism, French-speaking Canada feeling itself to be a nation fully as strongly as the other provinces feel themselves to be a nation. If these understandable and valid forms of nationalism seek their outlet primarily in cultural partnership, on terms of equality, then the political federalism we now possess will not be broken, though it may well have to make further accommodations to internal pressures. If the requirements of cultural dualism are pushed to political extremes, as evidenced in the renewed strength of the separatist movement in Quebec, then of course we shall have failed to maintain the original concept of Confederation and the Union will end in disunion. I am one of those who believe that the original constitution of Canada, changing as it must in face of new demands and new challenges, is still basically adapted to the sum total of our various hopes and aspirations.

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SECTION II: PRESIDENTIAL ADDRESS FOR 1960[1]

Philosophy and Theology—A Contrast

GERALD B. PHELAN

THE purpose of this paper is to make a comparison and draw a contrast between the starting points, the procedures, and the aims and objects of philosophy and theology. This implies, as I shall have occasion to note, a distinction between these two disciplines, but it in no way indicates a separation of one from the other. Nothing, therefore, could be further from my mind in making this distinction and pointing out this contrast than to question the existence of "Christian Philosophy" or to cast any doubt upon the validity of this concept.[2] My contention is, rather, that, no matter how close the collaboration between philosophy and theology may be, it is important to bear in mind the essential difference between them. For there are those who would not recognize any essential difference at all, and others who would make that difference so radical as to exclude all co-operation or collaboration between them.

The crux of the matter is aptly, though roughly, illustrated by two separate statements made to me, on quite different occasions, by two professors of philosophy, both clergymen (therefore, presumably not—in the late Dr. Sidney Smith's phrase—"theologically illiterate"). One was a Catholic, the other a Protestant. One of them said, "I always have to put my theology in my pocket when I talk philosophy"; the other said, "I never feel the need to shift gears when I pass from a theological to a philosophical discussion."

There is a third way of looking at the problem which clearly recognizes

[1]Delivered June, 1961.

[2]The controversy on this matter is of quite recent date; it arose some thirty-odd years ago but has practically petered out by now. There is a considerable bibliography on the problem, mainly in French, and most of it centring around the writings of Etienne Gilson and Jacques Maritain, the two most prominent and stalwart defenders of the historical existence and philosophical validity of a "Christian Philosophy."

On the face of it, the expression "Christian Philosophy" appears to involve a contradiction. The question is, of course, how can "philosophy" be a natural knowledge and understanding its object if it be qualified by the term "Christian," which normally implies faith and belief resting upon supernatural revelation? This problem, particularly in the form of the relations between Faith and Reason, has a very long history through all the ages of Western thought and culture. At the present time, I am not explicitly concerned with this question; I mention it chiefly because the title of my paper may appear to some to imply such a discrepancy between these two disciplines as to exclude the possibility of a "philosophy" which is at once authentically philosophical and genuinely Christian.

the radical difference between the philosophical and the theological approach yet does not demand that the theologian forget his theology when he philosophizes, nor the philosopher his philosophy when he theologizes. One does not need to put either in one's pocket at any time; and one learns to shift gears smoothly whenever the situation requires it. It is with this third attitude of mind, especially in respect of the radical difference between the philosophical and the theological ways of dealing with a question, that this paper is principally concerned.

The clue to the solution of this problem lies in the difference between what is technically known as *distinction in the order of specification* and *separation in the order of exercise*. Theology and philosophy are specifically distinct modes of knowing but this does not imply that in actual practice they must be separately exercised. In other words, a man can be at one and the same time a philosopher and a theologian without confusing his philosophy with his theology or vice versa. The contrast, therefore, between philosophy and theology which I wish to discuss in this paper belongs in the order of specification, not in that of exercise.

Whatever outlook may finally result from his philosophical research and reflections, the philosopher must face up to the challenge of a world full of problems for the human mind and, by bringing the light of reason to bear upon them, do his best to find an ultimately satisfying solution. It was such a quest that brought Jean Paul Sartre, for example, to elaborate the existentialist philosophy associated with his name. Not many years ago, while on a visit to Toronto, he remarked that, to his mind, only two philosophies today offered a solution to the basic and ultimate problems with which the mind of the philosopher is confronted: one, the philosophy of Karl Marx, the other, the philosophy of Thomas Aquinas. But to him, he explained, the philosophy of Marx is inhuman; Sartre treasures human life and its values. Again, the philosophy of Aquinas is theistic, while Sartre is an atheist. So he felt driven to invent a philosophy for an atheist.

This is a modern instance but the problem is by no means modern. When we look back over the history of ancient philosophy in the West we witness the persistent efforts of Greek thinkers to reach a rational understanding of the universe; not only the world of physical reality but also the world of living things and of man, the world of knowledge and thought, the world of art, the world of individual obligation and social responsibility, of public life, politics, and law. We owe to the Greeks that conception of wisdom as an over-all knowledge of whatever is knowable, in so far as the human mind is capable of penetrating, by its own effort to the ultimate causes and reasons for all that is. The progressive refinement of their philosophical reflection from its earliest beginnings in Miletos, among the Pythagoreans and Eclectics, culminates in the age of Socrates, Plato, and Aristotle, the golden age of Greek philosophical thought. Their successors continued these efforts through the Hellenistic and Roman periods, without achieving, however, their originality, depth, sublimity, and brilliance. Philosophical thought had

already reached an advanced stage of refinement and development when the Christian religion made its appearance.

With the coming of Christianity the Western world found itself confronted with a whole new realm of knowledge. A new light, the light of faith, was demanded for its acceptance. Problems which had not even been dreamed of in the philosophy of Athens or Rome presented themselves for solution. And a new dimension was added to human thought and reflection.

Of course, Christianity did not appear upon the scene as a philosophy but as a religion and a way of life; a religion which claimed to be the fulfilment of the religion of Israel, a way of life centred upon the Person of Jesus Christ. But both as a religion and as a way of life it did imply the acceptance of a number of truths purporting to be supernaturally revealed by God and communicable to man in human language. The language in which these truths were originally propagated was Greek and included a number of terms and expressions which heretofore were found in the vocabulary of philosophy.[3]

It is in this that the radical difference between philosophy and theology becomes manifest. Philosophy demands that whatever it accepts as true be known by the light of reason; theology, on the contrary, invariably appeals to Divine Revelation and the light of faith for the ultimate justification of its assent. Basically, the difference between philosophy and theology corresponds to the difference between reason and faith: reason gives its assent to what it sees to be true because *it sees it*; faith gives its assent to what is revealed by God to be true because *God said it*. Natural reason demands to see the evidence for what it accepts; faith rests upon "the evidence of things unseen," the authority of God revealing and seen by that special supernatural light namely, faith, communicated to the mind of man by God Himself. No statement can be accepted as philosophically valid unless it be known as evident in itself or shown ultimately to rest upon evident premises. No statement can be theologically valid unless it be known by the light of divine Faith and shown to be included in divine Revelation or implied by a truth revealed by God.

This fundamental distinction between philosophy and theology constitutes the essential contrast between these two disciplines both in regard to their respective objects and in regard to the light in which these objects are known. It is a distinction in the order of specification. But this contrast does not necessarily entail a separation in the order of exercise or the existential order. In other words, the same person, who, by training and study, has become qualified to deal philosophically with problems proper to philosophy (and is therefore entitled to be called a philosopher) may likewise have become qualified by training and study to deal theologically with problems

[3]It may not be amiss, at this point, to recall the difference between religion, on the one hand, and theology, on the other. Religion is a *moral* virtue concerned with the discharge of man's duties to God, worship, thanksgiving, repentance, and prayer; theology, on the contrary, is an *intellectual* discipline, both speculative and practical, of revealed truth.

proper to theology (and is therefore entitled to be called a theologian). The philosopher and the theologian in such a case are not two men. Rather, the philosophical quality of his mind and the theological quality of his mind, though *essentially* distinct, are not *existentially* separated but are exercised by one and the same person. In a word, philosophy and theology are two distinct mental qualifications which may or may not exist in and be used by the same man.

There is a threefold danger of confusion, however, to be guarded against in the exercise of these mental qualifications. The first is the danger of mistaking a philosophical proof as the demonstration of a theological point. The second is the reverse of this, namely, the mistaking of a theological proof for the demonstration of a philosophical point. The third is the danger of requiring a positive exclusion of theology from philosophy and philosophy from theology in dealing with their respective objects.

To illustrate the confusion that results from such aberrations, think of the sort of purely rational arguments, sometimes proffered by believing Christians, purporting to demonstrate such doctrines as, for example, the Divinity of Christ. To any clear-minded man it is ridiculous even to attempt to prove the truth of such Christian dogmas by the processes of syllogistic reasoning or any other rational procedures of demonstration. Similarly, to regard an appeal to such well-known teachings of the Christian faith as, for example, the creation of the world by God or life after death, simply because they are so generally accepted, as in any way establishing their philosophical validity is no less absurd. But, on the other hand, to fail to recognize that revelation and theology actually do raise issues which challenge philosophical reflection and have profound repercussions upon the general thinking of great numbers of people, or to question the value of philosophy as a useful instrument in elucidating the meaning and import of revealed truth, would spell an undue separation and isolation of philosophy from theology.

History gives ample evidence of the challenge which Christian revelation has offered to the philosophical mind from the earliest ages right down to our own days, and reciprocally, of the prominent role philosophy has played in the clarification of the theological expression of Christian dogma and practice. Indeed it may not be too much to say that Christian theology is largely responsible for the preservation of the wisdom of the Greeks. This does not imply, however, that any philosophical doctrine has ever become part of Christian belief itself or that Christianity is simply a religious philosophy. Without ever ceasing to be a religion and a way of life, it has been a constant source of stimulation to both philosophical and theological thought. Two well-known works of Etienne Gilson, *The Spirit of Mediaeval Philosophy* and *The History of Christian Philosophy in the Middle Ages* have shown in detail the extent to which Divine Revelation has raised problems of both philosophy and theology long after the advent of Christianity.

The whole procedure of philosophical and theological investigation exhibits a proportionate divergence of method and norms of judgment. The

theologian is concerned to establish the authenticity of the sources of divine revelation and to discover the meaning of the teachings they contain and their significance both for his mental as well as for his moral and religious life. Theology starts with an act of faith in the fact of revelation and the authority of God to reveal such truths to be accepted and such precepts to be obeyed as it may please Him to do. Just how one may be led to make such an act of faith is irrelevant to our purpose except in so far as, in the last analysis, it is by reason of a gratuitous gift of God, the gift of faith, that one is enabled to give assent to His revealed word. No man, however, could be expected to make such an act of faith unless he were convinced that to believe is an eminently reasonable thing for a man to do. The voluntary acceptance of the gift of divine faith is a necessary prerequisite for its bestowal.

Under the constant guidance of this light of faith, the theologian proceeds to employ all the resources of human scholarship and learning—history, archaeology, linguistics, philology, literary criticism, and so forth—to discover and interpret the oral and written accounts of what God has revealed. In like manner he uses philosophy to penetrate the deeper meaning and significance of divine revelation. It is in this context that the ancillary character of philosophy appears and it is for this reason that philosophy has been called the "Handmaiden of Theology."

Philosophy itself, however, proceeds along a quite different path and enjoys its own autonomy. Confronting the universe as it presents itself before him the philosopher asks questions—every question he can think of—and seeks to find answers that he can understand without relying upon the authority of anybody's word. He may not be entirely successful in his quest (indeed no philosopher has ever fully succeeded in solving the riddle of the universe) but he may well achieve a very considerable measure of true knowledge of the deepest reasons and causes of the order of nature, the order of thought itself, the order of morality, and the order of productivity and art. If the philosopher is also a man who has received the gift of faith, he is aware that God would never teach what is false. Consequently, should his reflections lead him towards conclusions at variance with revealed truth, he realizes that he is on the wrong track and he will retrace his steps and subject his philosophical thinking to rigorous criticism until he finds the flaw in his own thought. On the other hand, when he finds that divine revelation has given the answer to some of the baffling problems which have puzzled his mind, he will be stimulated to renewed effort to grasp the meaning of those answers and to tackle again those problems philosophically and try still harder to understand what he now believes.

Thus, despite the ineradicable contrast between philosophy and theology not only as two quite distinct species of knowledge but also in their methods and procedures, their starting points, and their aims and purposes, they may be mutually related in their actual exercise, and are, in fact, so related in the mind of one who is at once a believing Christian or theologian and a

philosopher. There is no need to do violence to one's mind by blocking off one avenue of knowledge when one enters upon the other; all that is needed is to avoid confusing the issues by mistaking a philosophical demonstration for a theological conclusion or vice versa. Theologism which places little or no value upon rational demonstration, and philosophism which unduly exalts reason are not unknown attitudes in the history of Western thought. Both are to be avoided if the true nature of the contrast between philosophy and theology is to be understood and recognized.

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SECTION IV: PRESIDENTIAL ADDRESS

The Origin of Continents

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MANKIND lives precariously on land surfaces that are the tops of large rocky protuberances rising 4,000 metres or more above the general level of the ocean floors. The largest of these are the continents. How have these huge land areas come into being and why have they not been cut down long since to sea-level or lower by the relentless attack of weathering and erosion? There are no completely satisfactory answers to these questions, but the rapid increase in knowledge about the Precambrian record has, it seems to me, provided new information bearing on these problems that has been ignored in much of the recent published speculations about them. This paper is presented mainly to call attention to some of these data from the Precambrian and to present a rough quantitative test of one hypothesis.

We now know a great deal about the surface features of continents and about the rocks that compose them to depths of a few kilometres. Something has been learned of the structure and physical properties of the deeper parts by studying the behaviour of elastic waves set up by natural and artificial shocks. Studies of the gravitational field, of heat flow, of the electrical and magnetic properties of the earth and of its behaviour under stress have also influenced speculations about the origin of continents. First, let us consider some of the broader features of the earth as it is today, as inferred from geophysical data.

Broader Features of the Earth's Crust

Geophysicists now appear to be in agreement that the outer part of the earth is composed of a crust[1] embracing the continents and the floor of the ocean, resting on a "mantle" of markedly different material, similar in its physical behaviour everywhere. Crust and mantle are separated by the Mohorovivic discontinuity (M) at an average depth of 10 to 11 km. below sea-level under the oceans and 30 to 40 km. deep under the continents. This discontinuity is marked by a rapid increase in the velocity of compressional and distortional waves from 6.7 km./sec. to 8.1 km./sec. in the case of the

[1]Crust as used here extends downward to the M discontinuity. Others have considered it to extend to 10 miles (16 km.) to the depth of isostatic compensation, or to 700 km., the depth of the deepest earthquake foci.

longitudinal waves and from 3.8 to 4.7 for transverse waves (Gutenberg, 1955, pp. 25 and 28). Comparison of these figures with velocities determined experimentally for rocks suggest a composition close to peridotite or eclogite for the upper mantle and basalt for the oceanic crust and the lower parts of the continents. The upper part of the crust has an average composition near that of granodiorite.

Early ideas of layering in the continental crust have had to be abandoned in favour of a gradation from relatively light acidic material near the surface to basaltic at some depth below 10 km., with only one possible discontinuity at around 20 km. depth, the so-called Conrad discontinuity (Gutenberg, 1955, p. 20). Geologists accept this view, noting that in the upper part, at least, the structure is extremely complex and irregular in detail and any apparent uniformity must come from statistical smoothing out of these complexities.

The floors of all the oceans below a thin layer of sediments behave physically as basalt and the evidence from volcanoes and floor samples indicate olivine basalt to be the prevalent material composing them.

Scientists generally appear to agree that the crust is approximately in flotational balance on a yielding mantle. The continents stand relatively high because they are less dense on the average than oceanic crust. Such imbalance as exists at any time is sustained by the strength of crustal rock units.

The Composition and Structure of the Outer Continental Crust

Turning now to geological information about the continents, we find that, ignoring local superficial blankets of sediments or "veils" of soil cover, alluvium, or glacial drift, they are all composed of a bedrock "basement" of more or less complex structure. This basement has ordinarily been considered in two parts—fossiliferous and non-fossiliferous. The fossiliferous basement is confined to the younger mountain-built belts. These are mostly near continental margins, have marked topographic relief, and, partly because of these features, have been studied in much more detail than the non-fossiliferous Precambrian basement of the continental interiors. Many geologists have spent all their lives studying fossiliferous rocks and have tended to consider the non-fossiliferous basement as something apart. Actually, no sharp contrast exists between Precambrian and younger rocks, except for the absence of fossils. Geological studies in Precambrian rocks have been extended rapidly in recent years in many parts of the world and the least metamorphosed parts have been found to be strikingly similar to the better-studied belts of the younger mountain systems. This similarity applies to their make-up, the processes active in forming them and the historical sequences represented. Where metamorphism has obscured the original composition, structural trends are less regular but still discernible and there is clear evidence of derivation of many of the high-grade meta-

morphic rocks from sediments and volcanics. Indeed, few geologists who have worked extensively in these areas would disagree with the view that these shields are made up of the roots of former mountain chains similar to those of younger age (see, for example, Collins, 1936; Wahl, 1936; James, 1960). Sederholm suggested in 1925 that most of the differences observed between these ancient belts and the younger ones are due to deeper denudation in the older areas (Sederholm, 1925, p. 17). Much of what has been learned since appears to the writer to support this view, though some differences may be attributable to changes within the earth body and in the composition of the oceans and atmosphere that developed gradually over a long period of time.

The Interpretation of the Record

Geologists working in the Precambrian have been under a great handicap in attempting to decipher historical details because of the absence of fossils. Correlation of rock groups widely separated in space has been largely hypothetical and the age relation of formations in close proximity in highly disturbed terrains often cannot definitely be established. Encouraging new developments from studies of radioactivity have recently provided extremely important information on age relations. I refer to age determinations made possible by the development and progressive improvement of methods for reading mineral "clocks" by precise determination of ratios of mother–daughter pairs in radioactive series. The evidence from age determinations by these methods is now giving striking confirmation of belts of different ages formed by a succession of complex cycles commonly referred to as orogenic cycles. It shows that each of these belts has remained essentially unchanged, except for limited warpings or movement on faults, since the last major deformation came to an end. There now appears to be no escape from the conclusion that each of the continents has grown through a series of orogenic cycles extending through at least 2.7 billion years (Ahrens, 1955).

Our knowledge of the orogenic cycle has come mainly from studies of the younger mountain systems, where the presence of fossils made it possible to trace through historical sequences in some detail. Each of these systems has its own individual character and history differing in many respects from all the others, but in broad outline there is marked similarity. The process starts with erosion from land surfaces and deposition in a trough or troughs, usually along a continental margin. Accumulation continues for a long period with concomitant sinking, so that thicknesses of 30,000 to 50,000 feet (9 to 15 km.) of sediments develop. Volcanic eruption and accompanying intrusion commonly occur in parts of the belt and this contributes substantially to the accumulation. Deformation eventually sets in and proceeds at intervals, affecting different parts at different times. The pile of volcanics and sediments is folded, faulted, and intruded by molten masses from below.

It is thickened and forms a topographic high which is gradually reduced through a prolonged period of erosion. Isostatic balance is maintained approximately throughout this process, departures from it being limited by the ability of rocks to sustain stress differences imposed by gravity. Relative stability eventually results, with the land surface near sea-level. A very long time is required for an orogenic belt to reach this state; the Appalachian System has not yet attained it after the 200 million years that have elapsed since the major deformation ended.

It is true, as Gastil (1960, p. 167) points out, that aberrent ages have been recorded in some of these belts. Some are, perhaps, incorrect values, resulting from one or more of many causes. Others, no doubt, represent real age differences. In this discussion, we are necessarily considering only broad belts of deformation like the Cordilleran system. Deformation in each such belt occurred in several stages extending over long periods of time of the order of 200 million years or more. Since most radiometric age measurements for the Precambrian are only accurate to $\pm$ 100 to 150 million years, apparent age differences of 400 to 500 million years may occur in a belt that was in fact a single unit and not the result of an older belt being destroyed by a younger. Also, it should be observed that, at continental margins, it is certain that parts of old platforms become involved in later marginal deformation without becoming completely reorganized. This could explain some occurrences of older rocks in younger deformed belts. Finally, it should be noted that deformation in such broad belts does not commonly occur from the continent outward. Generally, it would appear that the first major deformation occurs in island arcs at some distance out from the main continental margin as along the modern east Asian coast. Inner parts are deformed later and the whole mass finally becomes integrated with the continent. Thus, early deformed units may become involved in later ones but the whole belt finally becomes stable and stays that way indefinitely, except for minor warpings and faulting.

Ideas about the Origin of Continents

Many ideas have been expressed about the origin of continents. Those that have been considered seriously by some writers in recent years may be classified as follows:

Homogeneous Original Crust

A. Complete granitic crust formed by differentiation of a liquid earth.

(*a*) Catastrophic removal from ocean basins by tidal resonance. Continents are remnants (Darwin, 1908).

(*b*) Absorption into ocean floors, leaving continents as remnants (Petterson, 1954, p. 21).

(*c*) Removal from present oceans by erosion when these segments stood high (Poldervaart, 1955, p. 140).

(*d*) Crumpling and thickening to form continents and ocean basins (i) by gravitational sliding (Daly, 1926); (ii) by convection currents (Umbgrove, 1947, p. 253; Vening Meinesz, 1944; DeSitter, 1956, pp. 512–15); (iii) method unspecified (Poldervaart, 1955).

(*e*) Disruption by expansion of the interior (Carey, 1950, p. 311).

B. Complete basaltic crust formed by differentiation of a liquid earth.

(*a*) Erosion of exposed parts plus orogenesis, causing growth (Lawson, 1932; Gill, 1948, 1952; Wilson, 1949; Jacobs, Russell, and Wilson, 1959).

(*b*) Exudation of granite from differentiation of liquid below original gabbroic crust (Buddington, 1943, p. 137).

(*c*) Addition of masses from outer space (Howell, 1959, p. 276).

Heterogeneous Original Crust

A. Accumulation of local clots of siliceous scum during cooling of a liquid earth, followed by growth through the orogenic cycle.

B. Accumulation by infall of solids (Planetesmal Hypothesis), followed by growth of nuclei through the orogenic cycle.

Discussion of Hypotheses

For the purpose of this discussion I discard at once all those hypotheses that start with the assumption that the first outer crust of the earth was composed of granite or granodiorite or that large plates of such composition formed initially. The reason for doing this is that the internal structure and composition of the Shields cannot, it seems to me, be satisfactorily accounted for by any of the mechanisms proposed for producing the continents from such materials. It is extremely improbable that relatively light and high standing crystalline plates could be buckled downward in belt after belt to produce the patterns now found; also the oldest sediments in these belts do not show large contributions from acidic masses.

On the other hand, the orogenic process *could*, by repetition through the ages, produce a light superficial crust of acidic rocks from a denser basic original crust. This would be accomplished partly through weathering and erosion and partly from differential melting of sediments and volcanics when at depths of more than 20 km. in geosynclines (Wyllie and Tuttle, 1960, p. 234) a process long advocated by Scandinavian geologists and recently placed on a sound scientific footing by the accumulated experimental results involving years of effort by many workers at the Geophysical Laboratory, Carnegie Institution of Washington (Tuttle and Bowen, 1958). Additional verification has been obtained from experimental studies on the melting of natural rocks in the laboratories of McGill University (Kranck and Oja, 1960). Alkalic and silica-rich fractions form first and would tend to migrate towards low pressure areas, generally upward. Injection and reaction with solids would tend to produce feldspar and silica-rich rocks at an intermediate level with a silica-poor layer below and sediments and volcanics with injected acidic transgressive bodies in the cooler upper parts.

The details of this process are extremely complicated. Buddington has recently discussed the facts to be considered and the mechanisms involved (Buddington, 1959, pp. 738–9).

Information from the ocean basins is limited, but it all points in one direction—a remarkable uniformity of the bedrock below the sediments of these areas. The composition indicated for the outer few kilometres is olivine basalt.

The oceans are receptacles for sediments as well as for water. The accumulation of a thin layer of sediment would protect the bedrock from erosion, and thus it seems necessary to conclude that, as ocean waters accumulated, more and more of the surface of the earth was so protected until, at an early stage in the history of the earth, a large part of the bedrock surface was covered. This suggests that the bedrock floors of the true ocean basins, below the water and sediments, is the nearest thing to original crust that we are apt to find. Let us look more closely to see what would be involved in producing continents, with major characteristics as we now know them, from olivine basalt.

Information about the chemical compositions of rocks forming the shallow parts of continents is extensive and fairly reliable averages have been calculated. The average is close to that of granodiorite as shown in Table I, column A. Below depths of a few kilometres, we must be guided by seismic evidence. As noted in an earlier part of this paper, there appears to be a gradation downwards to basalt or something resembling it in its physical behaviour. Below M, the material is generally supposed to be peridotite or an eclogite-like material.

To produce the continents from an original crust of olivine basalt 5 km. thick would require utilization of such material from six times the present area of the continents. This is obviously absurd, so one must assume that material from below M was used as well. Since very large quantities of basalt, mainly tholeiitic, have been extruded on the continents at certain times and places, and dyking by olivine and quartz diabase is common in the continental interiors, it is evident that a substantial source of this material still exists beneath the continents. It seems necessary, therefore, to assume that basalt can be produced in quantity from the material below M. This could result either from partial melting (Bowen, 1928, pp. 315–17; Yoder, 1952; Verhoogen, 1954; Poldervaart, 1955) or by mineralogical change to a less dense assemblage. This idea of a phase change was apparently first suggested in 1914 by Fermor. It has recently been supported by calculations and by experimental evidence (Robertson, Birch, and MacDonald, 1958). Lovering (1958) and Kennedy (1959) have discussed the evidence and some of the consequences of such changes at the base of the crust and Noble (1961) has considered their implications in relation to isostatic adjustment. Either or both of the methods mentioned could produce basalt from mantle materials, so we may assume an adequate supply of basalt from this source to generate the continents.

As the orogenic cycle is repeated, material eroded from one mountain system helps to fill geosynclines of other systems, so some of the materials are worked over and over in the surface mill. Those substances that are normally solid at the surface must be retained in the system and the total mass of such solids should be the same regardless of transformations in metamorphism and igneous processes. We can conclude, therefore, that if the continents have been produced primarily from olivine basalt, all the varied products produced by erosion and orogenesis, if added together, should have the same average bulk composition. This means that the crystalline crust of the continents down to M, the partial cover of unconsolidated sediments, the sediments in the superficial parts of the younger mountains, the sediments on the ocean floors and the common rock-forming elements dissolved in sea water should, if combined, have an average bulk composition close to that of olivine basalt.

Poldervaart (1955) has assembled and published average compositions of rocks and estimates of mass and composition for various parts of the crust. These figures have been used in the computations for Table I. Water and other volatiles are ignored. They have undoubtedly played important parts in the transformations visualized, but in the gross relations here being considered, their exclusion should not affect the result significantly.

If the average material composing the stabilized continental plates at the surface (column A in Table I) has been derived from basalt by passing

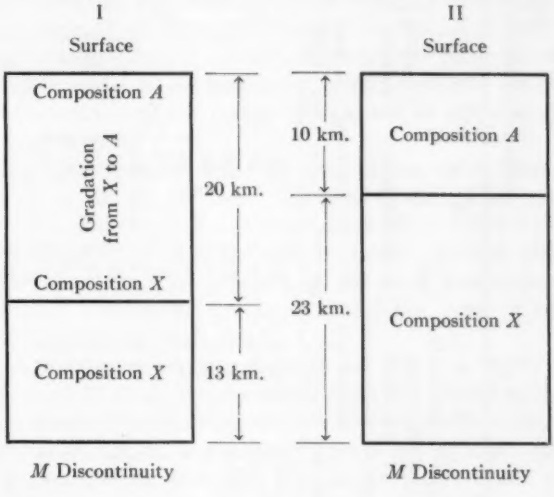

FIGURE 1. Column 1 above represents the make-up of the crystalline crust assumed as an average condition to fit the geophysical data. If this crust is reorganized basalt and the change from *A* to *X* has a linear relation to depth, composition *X* can be estimated approximately (see column II above and Table I).

TABLE I

AVERAGE COMPOSITION OF CRUSTAL MATERIALS

	A Stable continents Surface crust 10 km. thick		B All sediments		C Dissolved in sea water	D Sum of A,B, and C		E Olivine basalt		X Residue (E–D)	
	per cent	metric tons $\times 10^{15}$	per cent	m. tons $\times 10^{15}$	m. tons $\times 10^{15}$	per cent	m. tons $\times 10^{15}$	per cent	m. tons $\times 10^{15}$	per cent	m. tons $\times 10^{15}$
SiO_2	66.4	2796.8	51.4	757.3		62.2	3554.1	47.1	7576.3	38.7	4022.1
TiO_2	0.6	25.3	0.7	10.2		.6	35.5	3.0	483.6	4.3	448.1
Al_2O_3	15.5	652.9	12.6	185.4		14.7	383.3	15.1	2434.1	15.3	1595.8
Fe_2O_3	1.8	75.8	4.7	69.3		2.5	145.1	3.7	596.4	4.3	451.3
FeO	2.8	117.9	1.0	14.5		2.3	132.4	8.1	1305.7	11.3	1173.3
MnO	0.1	4.2	0.3	4.5		.2	8.7	0.2	32.2	0.2	23.5
MgO	2.0	84.2	3.1	45.0	0.9	2.3	130.1	7.9	1273.5	11.0	1143.4
CaO	3.8	160.1	22.7	335.9	3.5	8.7	499.5	10.9	1757.0	12.1	1257.5
Na_2O	3.5	147.4	1.2	18.3	23.3	3.3	189.0	2.7	435.2	2.4	246.2
K_2O	3.3	139.0	2.2	31.8	0.8	3.0	171.6	1.1	177.3	0.1	5.7
P_2O_5	0.2	8.4	0.1	1.8		.2	10.2	0.3	48.4	.3	38.2
Totals	100.2	4212.0	100.0	1474.0	28.5	100.0	5714.5		16119.7		10405.2

through the orogenic milling and smelting process, it should grade downwards to a residual material somewhat more basic than basalt. This may be the material that is ordinarily taken to be basalt because it transmits elastic vibrations at similar speeds. For a preliminary calculation, let us assume that the Conrad discontinuity at about 20 km. depth marks a level below which all the material is such a residuum and that the composition averages roughly the same down to the M discontinuity. The change from an average composition A at the surface to X at 20 kms. depth will, as a first approximation, be assumed to be roughly linear, or more specifically, it is assumed that an outer layer 10 km. thick of composition A, combined with an underlying 10 km. layer of composition X would give a close approximation to the actual average composition of the outer 20 km. of the continental crust. The above assumptions require also that the average composition of the continental blocks to M, at an average depth of 33 km., would be closely equivalent to that obtained by combining a 10 km. layer of average composition A with 23 km. of average composition X (see Figure 1). With these assumptions, the composition of X can be estimated.

Table I gives, in column A, the average composition of the surficial parts of the crystalline continents and the masses of the various oxides in a layer 10 km. thick. Column B gives Poldervaart's average for all the "cover sediments" on the continents and in the ocean basins, plus the folded sediments in the upper parts of the younger mountain-built belts. Column C gives the quantities of the common rock-forming elements dissolved in sea water and column D gives the total mass of A, B, and C and the average composition of all combined. Column E shows the composition of a mass of olivine basalt equal to the total mass of the crust and column X shows what would remain if all the matter represented by columns A, B, and C were extracted from E.

In making these computations, the area of the stable continental platforms is taken at 105×10^{16} km.^{2}, the area of the folded mountain belts 42×10^6 km.^{2}, and the shelf and slope areas 93×10^6 km.^{2} The 10 km. thickness of composition A is assumed to extend through the land areas (147×10^6 km.^{2}) and 10 per cent of the shelf and slope area, in all 156×10^6 km.^{2} The specific gravity of the 10 km. plate of acidic rocks is taken at 2.7 and that of basalt as 2.9.

According to this hypothesis, the material below a depth of about 20 km. and down to M at an average depth of 33 km. would have the average composition shown in column X, though a considerable range of compositions would, no doubt, be represented. This is not so much different from basalt as to preclude the possibilty that elastic waves would pass through it at about the same velocities. It differs from any common rock seen at the surface, but we must remember that it has been worked over at high temperatures and pressures in mobile belts where practically all gases and liquids could escape towards the surface. Lacking these fluxes, the melting point would be unusually high, so the chance of it ever reaching the surface would be exceptionally poor. Perhaps this is why one of these belts, once

formed, tends to persist as a stable element indefinitely. If any of this material did get involved in a later mountain-building episode, it could gain mobility by being mixed with other materials from geosynclinal accumulations or the siliceous upper parts of the crust and converted into some more familiar rock type, stable under near-surface conditions.

The results obtained appear to support the idea that the crust, as we see it today, could have been derived from basalt. One cannot deny the possibility that modest clots of siliceous scum formed some or all of the original continental nuclei. Exudations of differentiated granodioritic magma through a basaltic crust or chunks of siliceous material surviving from an earth formed initially by accumulation of solids could have served a similar purpose. There are, however, no data known to the writer to indicate that any of these were necessary parts of the system. If they did exist, they must have been small and no remnant of any such feature has so far been recognized.

An interesting feature of the derivation of continents from basalt is that the continental areas would have no more radioactive elements than the original basalt; hence there would be no greater heat output from this source than from the ocean areas, which helps to account for the similarity in heat flow suggested by the few figures available. The radioactive elements have, however, been concentrated in the outer parts of the continental blocks which are also poorer conductors of heat. This may result in a slow accumulation of heat below or within the continental crust sufficient to cause intermittent rise by differential melting or phase changes, both of which give an increase in volume. Perhaps this is why the continents have not long since succumbed to the downcutting by erosion, and the slow rise of the ocean waters resulting from accumulation of deep sea sediments, contributions from the interior of the earth and the lateral expansion of the continents.

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APPENDIX C

BIOGRAPHICAL SKETCHES OF DECEASED MEMBERS

John Cameron

1873–1960

JOHN CAMERON died at his residence in Bournemouth, England, on November 27, 1960, at the advanced age of eighty-seven years. He was born on September 16, 1873, in Laurence Kirk, County Angus, Scotland, and he proudly retained his Scottish manner of speech throughout his life. He was one of six children and his father was a prosperous farmer of Jacobite descent. He was educated at Montrose Academy and entered Edinburgh University in 1892. On graduation from the University with the degrees of M.B., Ch.B. with honours, in 1898 he immediately showed a preference for teaching and research by accepting an assistantship in the Department of Anatomy at the University of St. Andrews with Dr. James Musgrove who had been his professor at Edinburgh. He was also awarded a research fellowship and from 1903–06 he was Carnegie Fellow at St. Andrews. During the summers of 1902 and 1903 he went to Leipzig to work in the field of embryology with Professor Wilhelm His. In 1904 he received the degree of M.D. and a University Gold Medal from the University of Edinburgh and the D.Sc. from the University of St. Andrews. He was appointed senior demonstrator in anatomy in 1905 at the University of Manchester and in 1908 he became lecturer in anatomy at the Middlesex Hospital Medical School in London. While there he served as examiner in anatomy at the University of London and also on the Conjoint Board of Examiners of the Royal Colleges between 1910 and 1915.

In 1915 he came to Canada as Professor of Anatomy at Dalhousie University and he retained the chair until 1930 when he resigned owing to a heart ailment. He was immediately appointed Professor Emeritus. He returned to England to take up residence in London but later moved to Bournemouth where he remained for the rest of his life. In 1937 he fulfilled a life-long ambition by touring the world in the "Empress of Britain."

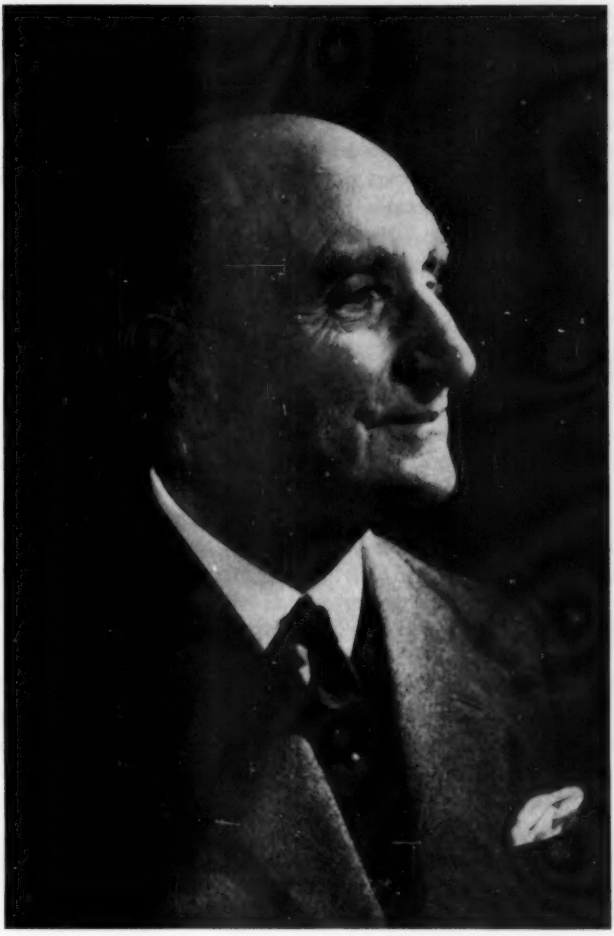
His scientific activities may be divided into two distinct periods. His early interest was in the field of comparative embryology and he published about fifteen papers on various aspects of the development of the nervous system and the special senses. When he came to Canada he was asked to examine the collection of osteological remains made during the Canadian Arctic Expedition of 1913–18. This turned his interest to the field of anthropological osteology and more particularly craniometry— an interest which he retained for the rest of his active scientific life. His early observations were published in 1923 in a small monograph on the osteology of the Western and Central Eskimos as vol. XII, part C, in the official report of the expedition. Cameron came to the conclusion that if the skulls of these Eskimos are really Mongoloid in origin then they exhibit at the present day some profound alterations from the general Mongolian type. The differences he attributed to habits of mastication. This work led to a long series of papers on

various aspects of craniometry which appeared in various *Transactions of the Royal Society* or in the *American Journal of Physical Anthropology* between 1924 and 1930. Many of the measurements were made on material in the Hamann Museum of Western Reserve University, Cleveland, and comprised studies on the North American Indian, the North American white man, the Alaskan Indian, various Eskimos and Mongols, some Anthropoid apes, and a few other mammals. Reprints of these papers were later bound together in three volumes as *Researches in Craniometry*. They number well over one hundred articles. On his return to England Cameron examined in a systematic manner the parts of skeletons of British prehistoric man in the Museum of the Royal College of Surgeons. The data were published in 1934 in a monograph entitled *The Skeleton of British Neolithic Man* in which it is concluded that the basic Nordic type has been profoundly influenced by the people of the Mediterranean basin. Cameron also published two small volumes on human anatomy for medical students, *Regional Anatomy* in 1918 and *Osteology and Arthrology* in 1922, which became known around Dalhousie as "my leetle bouks." In recognition of his scholarship he was elected to fellowship in the Royal Society of Edinburgh in 1905 and in the Royal Society of Canada in 1919.

Although John Cameron carried out many original investigations in the field of anthropology his greatest ability was as a teacher. Here his personality shone and his love of his fellow man was most evident. It is unusual for a professor to engender in his pupils and colleagues such affection as did John Cameron while he was at Dalhousie University. He was affectionately known as "Jock" by everyone and this in itself is a great tribute to the man. Typical of him is his remark on being presented with an illuminated volume which contained his photograph and the signatures of many of his former medical students at a dinner in his honour on his return to Canada in 1947, "This book will be kept in the archives of my home, but it will have a much safer and more permanent place in the archives of my heart." His was a strongly emotional nature and his love of music was a symptom of this. The only active practice of his medical qualifications came during World War I when he served part-time in the R.C.A.M.C. and as R.M.O. at Pine Hill Hospital in Halifax where he assisted materially with casualties after the explosion of December 6, 1917. Of this he later wrote "I must have looked like some fiend from the torture chambers of the damned." In religion he was a Presbyterian and very conventional in his philosophy.

In 1925 he married Elsie Cameron, the daughter of Provost James Moffatt of Glamis, County Angus, who predeceased him in 1948. They had no children. His memory is perpetuated by the dedication of a suite of rooms in the Forrest Building of Dalhousie University as "the John Cameron Rooms" in which research and teaching are carried out on living subjects by the modern methods of X-ray illumination. Few of our present fellows in Section V will remember this kindly modest Scottish gentleman who inspired such affection in both students and colleagues.

E. GORDON YOUNG



JOHN CAMERON

Jean Charbonneau

1875–1960

DE LA VIE intime de ce poète qui, d'après ses rares amis, ne se livrait guère, nous ne savons absolument rien. Une seule fois, attendant un autobus et causant avec Georges Pelletier, nous apprîmes de celui-ci que le piéton qui venait de passer le nez en l'air n'était autre que Charbonneau. Nous songeâmes à Charles Gill, que nous avions vu la veille déambuler, les yeux et les bras au ciel, entre les rails des tramways, complètement sourd aux appels de klaxon que multipliait le mécanicien. Avions-nous donc entrevu deux rêveurs du même acabit ?

S'il rêva, Jean Charbonneau dut commencer jeune. Né en 1875, sorti du collège en 1895, il n'a donc que vingt ans quand il fonde l'*Ecole littéraire* (lisez : lyrique et psychologique) *de Montréal*. Or, nous le savons par celui qui en fut le secrétaire pendant les premières années Louis Dantin, *Gloses critiques*, I, 1931, pp. 175–99), les membres entretenaient un double dessein : dominer le concert patriotique dont nous assourdissait, depuis 1860, *l'Ecole de Québec*, remplacer celle-ci par un chœur dont les chants s'inspireraient du parnassisme et du symbolisme. En somme, il ne s'agissait de rien de moins que d'étrangler le romantisme, de substituer à ses larmoyantes effusions une poésie impersonnelle et grandiose d'expression.

Cette expression grandiose, Charbonneau crut-il l'atteindre en s'inspirant de la métaphysique ? En tout cas, presque uniquement un poète, il fut avant tout un poète métaphysicien. Car il faut mettre à part, dans son œuvre, les trois volumes des *Influences françaises au Canada* (1916–20) et la monographie l'*Ecole littéraire de Montréal* (1935), deux ouvrages où le sujet principal est sans cesse oublié et remplacé par l'exposé, obscur et diffus, des théories littéraires et philosophiques chères à l'auteur.

La vraie contribution de celui-ci aux lettres, ce sont *Les Blessures* (1912), *L'Age de sang* (1921), *Les Prédestinés* (1923), *L'Ombre dans le miroir* (1924, prix David), *La Flamme ardente* (1928) et *Tel qu'en sa solitude* (1940). Il y a là une œuvre à la fois de doctrinaire et d'artiste.

L'artiste n'est que cela, « quand il condense sa pensée dans une courte pièce de caractère lyrique » (Mgr Roy). Mais sa tendance est au ton épique, par exemple dans *L'Age de sang*; alors l'artiste se perd en des considérations si nébuleuses qu'elles en deviennent insaisissables. C'est sans doute que la doctrine l'est aussi : panthéiste et fataliste en son fond, elle s'acharne à expliquer la vie par l'influence du Destin. Accoutumés que nous sommes à y toucher l'action constante d'une visible Providence, nous nous révoltons intérieurement contre ce pénible et vain effort.

D'ailleurs, le vocabulaire lui-même, aussi vague que la pensée est vaporeuse, empêche qu'on assigne à ces vers un sens défini. On ne nage pas ici dans les eaux de la philosophie ou de la poésie, mais dans la théosophie la plus abstruse et la plus inconsistante. Comme le divin enseignement de

l'Eglise est humain en regard de cette misérable « recherche de l'absolu »!

Charbonneau ne manquait pourtant ni du sens du rythme ni de l'art de l'image ni du goût de l'harmonie. On en jugera en relisant et en scandant *Le Sisyphe* dans *La Flamme ardente*. Dans *Les Prédestinés*, l'évocation du champ des aïeux est d'un écrivain sûr de son métier. Le tort du poète, ce fut de confondre trop souvent l'image avec l'idée et de noyer celle-ci dans la « fulgurance » de celle-là.

Ce qui restera de lui sans doute, ce sont moins les méditations ou les rêveries du penseur que le culte de l'écrivain pour la musique du vers et la truculence du verbe. Si ce n'est pas là beaucoup, c'est encore quelque chose.

Ceux qui voudraient se renseigner davantage sur ce laborieux pourront consulter Louis Dantin, *Poètes de l'Amérique française*, I (1928); Albert Pelletier, *Carquois* (1931); Mgr Camille Roy, *Regards sur les lettres* (1931).

EMILE CHARTIER

Jean Désy

1893–1960

LA TRADITION exige que les procès-verbaux de la Société royale du Canada rendent hommage à la mémoire des membres disparus au cours de l'année. Jean Désy était des nôtres depuis 1953. S'il ne s'agissait que de saluer en sa personne l' « immortel pour la vie », dont nous avions fait l'heureux choix il y a huit ans, quelques lignes suffiraient. Les circonstances, en effet, n'ont pas permis à notre section de l'accueillir *in hymnis et canticis* comme le furent la plupart de ses pairs. Elles ont en outre retenu loin de nos réunions, hors du cercle de notre activité propre, le professeur, écrivain et diplomate qui nous avait honorés en acceptant le « fauteuil » symbolique dont la faveur lui était due. Mais c'est précisément la longue et fructueuse carrière de ce professeur, de ce diplomate, de l'homme cultivé en un mot, qu'on me demande de rappeler ici. Deux pages n'y suffiront pas.

C'est tout un livre qu'il me faudrait composer pour suivre Jean Désy, de l'université où il sut conquérir haut la main tous les grades majeurs, avant d'y enseigner en maître authentique, jusqu'à l'ambassade de Paris où il brilla comme il avait brillé à Rio de Janeiro et à Rome. Sans compter qu'entre ces deux pôles, il importerait de faire une large place à l'homme d'esprit et de goût, au «Canadien pure laine » qu'il ne cessa d'être, au conférencier disert qui savait habilement joindre l'acte à la parole, au voyageur averti. Et il ne saurait être question d'oublier l'écrivain qui n'a pu, hélas ! faute de temps, enrichir nos lettres autant qu'il le désirait et que nous l'espérions.

Né à Montréal, Jean Désy y fréquenta de petites et de grandes écoles. Ses études de droit terminées, dans cette institution qui était encore une succursale de l'Université Laval, il ambitionna d'enrichir sa formation intellectuelle par un séjour à Paris. Il fut ainsi l'un des premiers boursiers de la province de Québec, sans avoir — pas plus que nous par la suite — l'impression ou le désir de s'exiler. Désy est allé en France « avec une attitude adulte ». Inscrit à la célèbre Ecole de la rue Saint-Guillaume — les « Sciences-Po » — qui devait accueillir plusieurs d'entre nous, il y eut, entre autres maîtres qui devinrent plus tard ses amis, André Siegfried. Et c'est ce même André Siegfried, dont le Canada n'a point suffisamment reconnu les services et les mérites, qui allait, en juin 1958, rendre le plus éclatant témoignage à l'intelligence, à l'esprit souple, pour ne pas dire au flair de son ancien élève, lorsque ce dernier, contraint par la maladie, abandonna la carrière.

Jean Désy, écrivait alors l'éminent économiste, « n'a eu aucun besoin de s'acclimater sur les bords de la Seine ». Collaborateur de Philippe Roy — comme Pierre Dupuy appelé à lui succéder — notre compatriote a peut-être connu, entre 1928 et 1939, sinon les plus intenses, du moins les plus agréables années de sa vie de diplomate. Bruxelles et La Haye ne furent que de brèves étapes, car l'Europe devenait presque aussitôt, une fois de

plus, le champ de bataille où se jouait la liberté du monde. C'est alors que Jean Désy fut nommé au Brésil où les circonstances lui permirent de se lier d'amitié avec Bernanos. Après un intermède à Radio-Canada, la carrière reprenait ses droits et Désy eut pour mission d'ouvrir notre première ambassade à Rome. Paris seulement pouvait ensuite couronner une existence aussi brillante et fructueuse. Et Paris ne ménagea à notre représentant ni ses sourires, ni ses grâces, ni ses faveurs. Autant que l'Académie des sciences morales et politiques, qui le reçut au titre de membre correspondant, l'Académie des psychologues du goût s'honora de l'accueillir dans ses rangs. Les Chevaliers du Tastevin voulurent aussi se l'attacher . . . Tant il est vrai, comme Daniel-Rops l'a souligné, que Jean Désy était de cette France où, si Péguy ne s'est pas trompé, « le spirituel lui-même est charnel ».

Depuis longtemps Jean Désy se proposait d'assembler en un volume les plus solides de ses travaux. Il s'en était ouvert à l'homme qui fut le maître et le modèle de notre génération : Edouard Montpetit. Et c'est ainsi que l'ouvrage ayant pour titre les *Sentiers de la culture* était prêt à paraître quand son auteur retrouva Paris.

Diplomate, notre regretté compatriote avait donné raison à Siegfried pour qui « un Canadien peut être en mesure de comprendre Washington comme un Américain, Londres comme un Britannique, Paris comme un Français ». Ecrivain ou conférencier, il ne cessait de mériter le témoignage que lui rendait Edouard Montpetit dans la « postface » des *Sentiers de la culture*, ayant partout fait honneur aux siens, étant toujours resté fidèle aux siens.

Brutalement emporté au début d'une retraite qui s'annonçait comme devant être, toutes proportions gardées, aussi féconde que l'avait été sa vie active, Jean Désy est mort le 19 décembre 1960, dans ce Paris où tant d'amitiés françaises continuaient de lui faire cortège. Ses obsèques ont été célébrées à Saint-Philippe-du-Roule, qui est, si je ne me trompe, l'église paroissiale de l'Ambassade du Canada. Mais c'est dans la terre natale qu'il repose aujourd'hui, dans cette terre qui ne cessa jamais d'être au premier rang de ses affections et de ses pensées. Admirablement préparé à bien remplir les tâches multiples qui lui furent confiées, il avait, par surcroît, toujours su mettre en pratique la sentence du poète mineur, Publius Syrus, dont il m'arriva de lui faire l'hommage il y a plus de vingt ans : *Quodcumque animum sibi imperavit, obtinet.*

JEAN BRUCHÉSI

Jean Désy

Thorleif Larsen

1887–1960

THE DEATH, on March 22, 1960, of Thorleif Larsen of the University of British Columbia, brought forth numerous testimonies of the gratitude and affection which he inspired in successive generations of students.

Born on June 10, 1887, in Sponviken, Norway, he was brought to Canada by his parents in 1890. His early education took place in the public and high schools of New Westminster, B.C. He attended the University of Toronto, taking the B.A. degree with honours in English in 1906, and the M.A. with honours in Icelandic in 1907.

In 1907 he was awarded the Rhodes Scholarship for British Columbia. Enrolled in Exeter College, Oxford, he was awarded the B.A. degree with first class honours in English language and literature in 1909. Two years of research in the Bodleian and British Museum libraries followed.

On April 19, 1911 he married Irene Reynolds of Paxton Hall, Huntingdonshire. They had four children: John, Maurice Patrick, Edward, and Mary Jeanne.

Having returned to Canada in 1911 and taught for a year at the Victoria High School, he read law, was admitted to the Bar of British Columbia in 1915, and practised law in the firm of Whiteside and Larsen until 1917.

In February 1917 he enlisted as a private in the 253rd Battalion and went overseas in August of that year. In England he was attached to the First Reserve Battalion, rose to the rank of sergeant, and in August 1918 was transferred to an Officers Cadet Battalion, at Fermoy, Ireland. He was returned to Canada after the war and discharged in March, 1919.

In September, 1919, he joined the Department of English of the University of British Columbia, becoming Associate Professor in 1925 and Professor in 1936. Upon his retirement in 1952, he was appointed Professor Emeritus.

His election to the Royal Society of Canada took place in 1934.

Thorleif Larsen's performance as a teacher of English was from the first outstanding and he became a legend in his own lifetime. He possessed the virtue of self-effacement in the interests of bringing the student in the classroom and the author under discussion together. His dominant interests were the poetry and drama of the Elizabethan period and the theory of poetics. His immense patience and reasonableness with student idiosyncrasy were complemented by the glow of appreciation with which he invested the pages of his favourite authors and his belief in the power of poetry to liberate and inform the mind. His enthusiasm for the Elizabethans never failed. Twice, in 1924–25 and in 1929–30, he returned to Oxford to do research in the field of sixteenth-century drama.

What made him an ideal guide for the undergraduate was that his feeling for poetry was combined with a search for precision in scholarship.

It was typical that, with his colleague F. C. Walker, he should bring out a guide to English pronunciation, published by Oxford University Press.

His example was such that it became a landmark in the history of the university and the department he served, and in the annals of the Letters Club, of which he was patron. He will be held in long and grateful remembrance for his learning, his love of literature, his modesty, and his kindness.

ROY DANIELLS

THORLEIF LARSEN

Victor Morin

1865–1960

VICTOR MORIN, docteur en droit, notaire depuis soixante-douze ans, ancien président de la Chambre des Notaires de la province de Québec, ancien président de la Société royale du Canada, président du conseil de la Société nationale de Fiducie, professeur émérite de la faculté de droit de l'Université de Montréal, auteur de droit et d'un grand nombre d'études, est décédé à sa demeure, sise à l'ombre de l'Université de Montréal, le 30 septembre 1960, après avoir été définitivement alité moins de quinze jours. Bien que sa santé fut déclinante depuis dix-huit mois, il était encore descendu, rue Saint-Jacques, au début de mai précédent, pour participer aux déliberations de l'un des conseils dont il faisait partie. Il était en sa 96ème année.

Né à Saint-Hyacinthe le 15 août 1865, du mariage de Jean-Baptiste Morin et d'Aurélie Côté, il avait reçu sa formation au petit séminaire de sa ville natale, cours 1876. Il étudia le droit à l'Université Laval de Montréal, qui avait alors son toit au Château de Ramezay.

Admis au notariat en juin 1888, il avait exercé sa profession jusqu'à soixante jours avant son trépas. Il avait signé son dernier acte en minute le 29 juillet précédent, sous le no 26.164. Inutile de l'ajouter, c'est là plus que le double de l'exercice moyen des praticiens.

Il s'était d'abord établi à Acton (Bagot), où il avait été secrétaire et trésorier de la Ville et de la Commission des écoles.

En 1890, il s'établissait à Montréal et il entrait à l'étude de Denis-Emery Papineau et de François-Samuel Mackay, notaires, où il avait fait sa cléricature. Il devint éventuellement chef de l'étude, et ces dernières années, son fils, Lucien, était son associé principal.

Toujours soucieux des intérêts professionnels, Victor Morin, devenu trésorier de la Chambre des notaires de la province en 1897, devait remplir cet office plus de trente ans, jusqu'à ce que ses confrères le portent à l'honneur suprême d'une profession, en l'appelant à leur présidence en 1930. Cet important mandat comporte une véritable magistrature, les professions libérales ayant la lourde prérogative d'être constituées juges de leurs membres. M. Morin eut à le remplir notamment pendant les premières années de la terrible crise économique, qui s'abattit sur le continent à cette époque, et qui emporta dans son tourbillon les espoirs, les biens, parfois l'honneur de tant de gens, y compris des officiers publics, hélas, qui avaient trop présumé de l'avenir.

En 1917, il avait fondé l'Association générale du Notariat canadien en y assumant le secrétariat, qu'il remplit pendant cinq années, et il présida aux destinés de cette association cinq autres années, 1922–27.

Notaire titulaire de la Corporation de la Ville de Montréal pendant treize ans, de 1897 à 1910, il avait encore fait partie du Conseil de Ville de

Montréal en qualité d'échevin, pendant les années 1910 à 1913. C'est au cours de ce mandat qu'il avait proposé et fait accepter par le Conseil du temps, l'établissement de la bibliothèque municipale, dont l'imposant immeuble de la rue Sherbrooke fut inauguré fort solennellement lors d'une visite en Amérique, au cours de la première grande guerre, du maréchal Joffre. Il avait été commissaire de la Bibliothèque de la Ville, de 1915 à 1918.

Il avait également proposé, et fait adopter, un système de classification des Archives de la Ville, et il se peut que son heureuse inspiration ait été pour quelque chose dans la sauvegarde de ces Archives, lors de l'incendie de l'hôtel de ville, quelque dix années plus tard (1922).

Professeur de droit administratif à la faculté de droit de l'Université Laval de Montréal pendant dix ans, 1909–19, il était devenu en cette dernière année, professeur de procédure notariale, poste qu'il remplit pendant vingt ans. Attaché pendant trente ans à la faculté, dix générations d'étudiants avaient défilé devant sa chaire. A sa retraite, il y a vingt ans (1939), la faculté lui conféra la qualité de professeur émérite. Dès 1916, l'Université Laval lui avait décerné un doctorat en droit *honoris causa*.

En 1930, il avait été appelé à faire partie de la Commission d'étude du code civil de la province en ce qui a trait aux droits de la femme. Il était devenu, en 1935, vice-président de la Commission provinciale de rachat des rentes seigneuriales, qui eut pour mission de purger les derniers vestiges hypothécaires constitués en vertu de l'ancienne tenure des terres de la province, imparfaitement abolie par la loi de 1854.

Des esprits hautains prétendent parfois que le droit, pour une grande partie, n'est que le serviteur de l'activité économique d'un pays. C'est là une vue plutôt sommaire d'un état complexe, et il n'y a pas lieu de s'attarder à rechercher ici les éléments de priorité de la situation. Il serait certes plus juste de tenir que le droit donne forme à une substance, souvent inarticulée. De là que les conseils ou l'esprit organisateur d'éminents praticiens du droit soient tant recherchés et sollicités par les sociétés commerciales, les grands organismes de la vie économique modernes, qui, devant l'invasion constante et progressive du dirigisme étatique, ont grand'peine à se suffire dans le dédale de législations qui se chevauchent quand elles ne se contredisent pas.

Victor Morin avait été président, de 1909 à 1916, de la Provinciale, compagnie d'assurance-vie et d'assurance-incendie. A l'époque de l'expansion immobilière de la métropole d'avant la première grande guerre, il avait encore été président, de 1910 à 1917, du Crédit métropolitain.

Une société d'assurances avait hésité, lors de son mariage, à lui accorder une assurance-vie, et cela l'avait amené, comme il le raconta un jour, non sans humour, à l'étude de la constitution et de l'organisation de ces institutions. Entré à l'Ordre indépendant des Forestiers, il fut plus de quarante ans, vice-président de cette société, dont le siège principal est à Toronto, et son président général, de 1941 à 1949. Il était l'auteur d'une refonte de la constitution de cette société.

L'un des organisateurs de la Caisse nationale d'économie, il en avait été le président de 1915 à 1924.

Enfin, confondateur de la Société nationale de Fiducie en 1918, il était président de son conseil d'administration depuis.

Depuis 1940, il était président du bureau des commissaires censeurs de la Banque provinciale du Canada. Il était encore président, depuis plus de vingt-cing ans, du Musée Historique canadien de Montréal.

Président général de la société Saint-Jean-Baptiste de Montréal pendant huit années, 1916–24, il avait été l'un des initiateurs, avec son ami et collègue en divers conseils, E.-Z. Massicotte, LL.D., ancien directeur des Archives judiciaires de Montréal, du grand défilé du 24 juin par la principale artère de la ville, et qui réunit chaque année des centaines de milliers de citoyens et de visiteurs; et encore de l'érection au Pied-du-Courant, à Montréal, du monument à la mémoire des Patriotes exécutés en 1838–39; d'un voyage patriotique au pays des ancêtres; de l'érection de l'immense croix qui brille au sommet de la colline du Mont-Royal, et d'autres initiatives du genre.

Il avait également été président, à la même époque, de la Société historique de Montréal, dont il dirigea les destinés pendant douze années, de 1916 à 1928. Il en réorganisa les cadres, récrivit sa constitution et lui insuffla une vie et un esprit qui furent continués par ses successeurs, le grand érudit Aegidius Fauteux et l'ancien recteur de l'Université de Montréal, Mgr Olivier Maurault, P.S.S., P.A.

Membre de la Commission des Monuments historiques de Québec depuis sa constitution en 1922, et qui a tant fait pour la sauvegarde des sites sacrés par le labeur de nos aïeux, la conservation, la restauration et le culte des monuments qui restent de leurs œuvres, il a également fait partie, pendant cinquante ans, du Conseil de la Société d'archéologie et de numismatique de Montréal, société fiduciaire du Château de Ramezay, dont il fut le président pendant trente années, 1927–57. C'est la dernière institution, en dehors de ses activités professionnelles, au sort de laquelle il consacra ses énergies, avant que sa santé ne le contraignît à la retraite définitive. Consignons ici qu'il fut l'un des grands artisans, ces dernières années, de la restauration en son style originel, de cet édifice, où il avait passé son temps d'étudiant, dont l'érection remonte à 1705, et qui est bien l'un des plus beaux exemples de ces Archives de pierre, selon sa belle formule, qui nous rattachent à ce lointain passé.

Directeur, pendant quarante ans, de l'Alliance française de Montréal, 1907 à 1947, il avait encore fait partie du jury du prix littéraire de la province, dit prix David, du nom de son initiateur, l'ancien secrétaire de la province, Athanase David. Il était aussi un des membres fondateurs (1935) de la Société des Dix, qui a publié, depuis vingt-cinq années des cahiers d'étude d'histoire. C'est à ce périodique que M. Morin avait donné, l'année même de son décès, son dernier travail où, pressentant une fin prochaine, il formula ses adieux à ses fidèles lecteurs.

L'un des fondateurs du Cercle universitaire de Montréal, il en avait été l'un des premiers directeurs. Il avait également fait partie de la Société des Ecrivains canadiens — la « Canadian Authors Association » — avant la création de l'association de langue française de ce nom, dont il fut également membre.

Il avait été marguillier de l'antique église Notre-Dame de Montréal à l'époque où Mgr Maurault en était le curé, *circa* 1929.

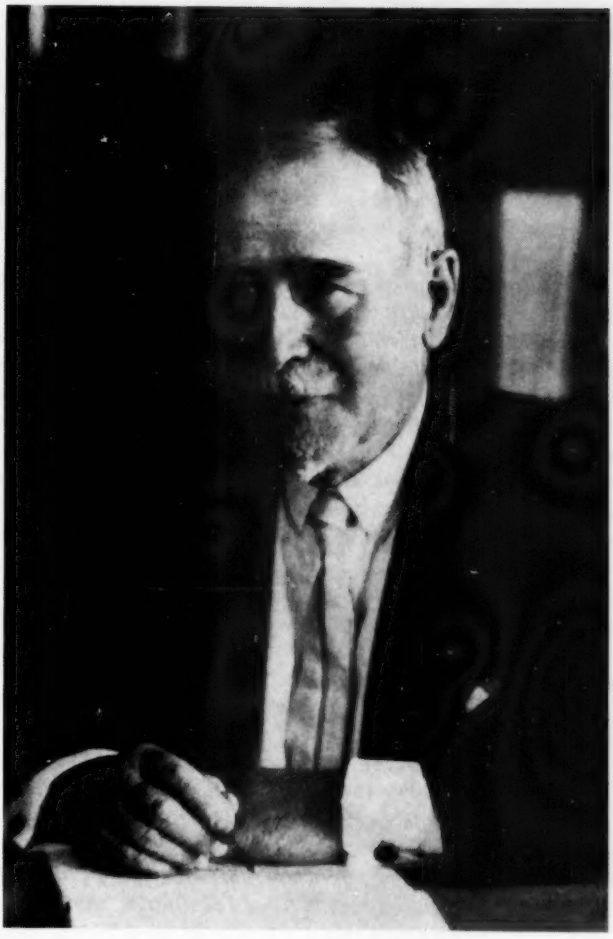
La plus prestigieuse société, en dehors de sa profession, à laquelle il fut appelé, fut sans doute l'académie de son pays, la Société royale du Canada, où il avait été élu membre en 1916, dont il devint président général en 1938. Lors du congrès annuel de cette société tenu à Montréal en 1939, il avait fait les honneurs de sa présidence avec un éclat peut-être inégalé, et il y avait remporté avec son dîner-opérette, auprès de nos compatriotes anglophones, un grand succès.

Comme si ces activités multiformes n'avaient pas suffi à son extraordinaire vitalité, Victor Morin a commis encore une œuvre écrite considérable. En dehors de nombreux articles, donnés à l'ancienne *Revue canadienne*, au *Bulletin des Recherches historiques*, aux *Cahiers des Dix* déjà cités, à la *Revue d'histoire de l'Amérique française*, il faut signaler sa collaboration à la *Revue du Notariat* qui s'étend sur plus de quarante-quatre années, 1904–48. La liste de ses travaux apparaît à la *Table des Matières des 50 premières années de la Revue*. N'en retenons que ses Hommages à deux anciens présidents de la Chambre des Notaires, L.-P. Sirois et Narcisse Pérodeau. Sa production en ouvrages, études et travaux, qui ont pris la forme de volumes et de brochures, va de 1909 à 1955. Un essai de bio-bibliographie en a été tenté en 1939 par Hélène Beaudoin.

Il serait injuste de prétendre ici réciter les titres de toutes ces études, voire d'en tenter un classement sommaire, qui risquerait de déborder les cadres de cette esquisse. Retenons les études majeures, si l'on peut dire, et qui vont d'ouvrages d'ordre juridique, comme sa *Procédure des Assemblés délibérantes*, 1939, son étude sur les *Seigneurs et Censitaires*, 1941, à tant d'autre, où une technique savante s'allie à une aimable érudition, comme son *Traité d'Art héraldique*, 1919, qu'il avait repris, en 1957, sous le titre, *La Science du blason*, les *Médailles anciennes décernées aux Indiens*, 1916; *La Chanson française à travers les siècles*, 1939; les *Fastes historiques du Vieux Montréal*, 1944; les *Ordres de Chevalerie religieuse au Canada*, 1940; la *Légende dorée de Montréal*, 1949.

Dans un autre ordre il avait donné *Croquis montréalais*, 1929, joliment illustrés par l'artiste G.-W. Simpson, les *Ramezay et leur Château*, 1939; *Fleury Mesplet, premier imprimeur de Montréal*, 1939; le *Vieux Montréal*, 1942; un *Dîner-Opérette* en deux actes, 1952, etc.

A la Société royale du Canada il avait publié « Une Société secrète de patriotes canadiens aux Etats-Unis » (l'Ordre des Chasseurs de 1838), 1930; « Superstitions et croyances populaires », 1937; « Aux Sources de l'histoire de Montréal », 1942; « Les Traités du Gouvernement canadien



VICTOR MORIN

avec les Indiens du Nord-Ouest », 1938; « L'Echauffourée américaine de 1775–1776 au Canada », 1950; et des esquisses biographiques du premier maire de Montréal, Jacques Viger, 1938, d'un autre maire de la ville et ancien secrétaire d'Etat, Fernand Rinfret, 1940, du poète, Albert Lozeau, 1924, d'Ernest Choquette, 1941, de sir Thomas Chapais, 1947, des archivistes Francis J. Audet, 1944, et E.-Z. Massicotte, 1948.

Consignons encore l'un des mieux venus de ses ouvrages où il a plus mis peut-être de son incurable optimisme, de sa confiance dans les êtres comme aux événements, *L'Utile et le Futile*, 1943.

Son dernier livre *Le Gouverneur et Madame de Ramezay reçoivent* (Montréal, 1957), porte sur la relation du bal historique donné en 1955 au Château de Ramezay à l'occasion du 250ème anniversaire de sa fondation, et qui fut célébré avec tant d'éclat.

Inutile de l'ajouter, cette liste sommaire n'a rien d'exhaustif.

Il n'y a pas d'étonnement qu'aussi répandu en tant de milieux divers, Victor Morin ait recueilli les décorations, distinctions et honneurs que les corps constitués et les ordres décernent à ceux qui paient de leur personne. Il était officier de l'Instruction publique de France, chevalier grand'-croix de l'ordre du Saint-Sépulchre, médaille d'or de la Compagnie des Notaires de Paris, titulaire de la médaille du jubilé du Roi George V, de la médaille de l'Alliance française, de la médaille de la Société historique de Montréal, de la médaille Chauveau de la Société royale du Canada, et de décorations de la Ligue du progrès civique de Montréal et de la Société du Parler français.

Il est également bien connu qu'il avait réuni en son ancienne demeure de la rue Saint-Urbain, près Sherbrooke, acquise de la succession de Trefflé Berthiaume, l'ancien directeur et président du quotidien montréalais, *La Presse*, l'une des bibliothèques privées les plus considérables du pays. Hélas, il avait dû mettre partie de ses collections en vente, à New-York, à la suite de sérieux revers de fortune qu'il subit, comme tant d'autres, pendant la terrible dépression économique des années 1930. Cette vente avait été une déception et il n'avait pas réalisé le tiers des recettes attendues.

Il avait reconstitué, en partie, ses collections et c'était un charme que de l'aller voir en sa nouvelle demeure de la Côte-des-Neiges, où il passa ses dernières années, entouré de tant de livres précieux aux belles reliures, et tenus dans un ordre parfait. Il y avait encore ajouté une précieuse collection de médailles, dont il avait disposé il y a plusieurs années.

Fils unique d'un père, qui était lui-même fils unique, il l'avait perdu fort jeune, et sa mère avait convolé, en 1876, avec Pierre Beauregard, de Saint-Hyacinthe. Il avait épousé en premières noces, en 1893, Fannie Côté (m. 1895), fille de Daniel Côté, de Biddeford, Maine. Il en eut un fils, Lucien, devenu son associé professionel. Il avait convolé en 1896, avec Alphonsine Côté (m. 1946), fille de Victor Côté, industriel, de Saint-Hyacinthe. Il eut de ce second mariage douze enfants, dont huit survivent : Marc, lieutenant au régiment de Châteauguay, 1940, Guy, Roger, Gisèle (madame Gérard

Lortie) qui, ces dernières années, partageait son toit, Claire (madame Roger Gauthier), Marie-Huguette (madame Carlo Karrer), et mademoiselle Renée Morin, de la Société d'Education des adultes. Il avait eu, entre autres, deux autres fils, Réginald (m. 1939; époux de Marguerite Ouimet), capitaine au 65e et qui servit outre-mer en 1914, et André (1902–41), qui, reçu avocat en 1931, fut emporté par une pneumonie; il était, pour lors, lieutenant au régiment de Châteauguay. Il laisse encore dans le deuil quatre petites-filles, quatre petits-fils et deux arrière-petits-enfants.

Il eut d'imposantes obsèques à l'église paroissiale Notre-Dame-des-Neiges, auxquelles officia son ami, l'ancien recteur de l'Université de Montréal, Mgr Olivier Maurault, P.S.S., P.A., et où l'on distinguait, dans la nef, une foule de citoyens, représentants des corps publics et des nombreuses sociétés dont il avait fait partie.

JEAN-JACQUES LEFEBVRE

Jean-Marie Nadeau

1906–60

Il eut voulu être magistrat, il l'eut été; professeur, historien, philosophe, il l'eut été. Sa destinée se fut écoulée tout entière et se fut élevée jusqu'au sommet dans toute carrière dont le succès exige l'activité intellectuelle pour soutien, la méthode pour guide et la conscience pour flambeau.

R. ALLOU et C. CHENU, *Grands Avocats du siècle* (Paris,1894).

JEAN-MARIE NADEAU, licencié en droit, licencié en sciences sociales et politiques, licencié en lettres, avocat depuis trente ans, chef de l'étude Nadeau & Nadeau, de Montréal, membre de la Société royale du Canada, professeur émérite de la faculté des lettres et ancien vice-doyen de la faculté des sciences politiques et sociales de l'Université de Montréal, a été emporté instantanément dans une collision de voitures, survenue sur la voie sir Wilfrid Laurier, près de Drummondville, le 5 octobre 1960. Revenant de Québec, il venait d'y reçevoir des mains du premier ministre de la province, Me Jean Lesage c.p., c.r., son mandat de procureur de la province près la Commission royale d'enquête, nouvellement constituée, sur l'ancienne administration provinciale. Il n'avait que 54 ans.

Il avait eu le bonheur de naître — le 8 décembre 1906 — et de grandir en ce centre de la plus riche région agricole de la province comme l'a désignée le grand géographe Raoul Blanchard, à Saint-Césaire de Rouville.

Après de brillantes études classiques au collège de Saint-Laurent (B.A., 1927), il étudia le droit à l'Université de Montréal (LL.L., 1930). Ses confrères l'avait élu, en troisième année de droit, à la présidence de sa classe. Il poursuivit sa cléricature sous Me J.-C. Ostiguy, devenu en 1937 protonotaire au district de Beauharnois, et sous Eugène Simard.

Avec ses études de droit, il avait mené de front des études à la faculté des sciences politiques et sociales de l'Université de Montréal, dont il sortit licencié. C'est là qu'il avait lié connaissance, et entretenu depuis, d'étroites relations avec le fondateur et l'ancien doyen de cette faculté, Edouard Montpetit.

L'un des cerveaux le plus naturellement philosophique de sa génération, et doué des qualités propres à cet esprit, soit une faculté singulière d'analyse et un pouvoir de syntèse peu commun, tout s'ordonnait chez lui en fonction de principes. Fuyant d'instinct le brillant et la papillotage, sa pensée se déroulait comme dans un vaste tableau savamment ordonné, et les failles en étaient peu faciles à déceler.

Admis au barreau de la province en juillet 1930, rien d'étonnant qu'il fût, dès lors, le choix des autorités universitaires pour l'une des bourses d'étude aux facultés d'Europe, encore rares à l'époque, octroyées par le gouvernement de Québec, et qui dépendaient de l'ancien secrétaire de la province, Athanase David. Se préparant pour le professorat, J.-M. Nadeau se rendit d'abord à la faculté des lettres de Rennes, où il prit sa licence.

Passé à la Sorbonne, il s'inscrivit pour plus de deux années à la faculté de droit et en rapporta un diplôme d'études supérieures. Il suivit également à Paris des cours à l'Ecole des chartes. En ses premières vacances d'Europe, voyageant en Espagne, il était à Madrid lors du renversement de la dynastie séculaire en 1931. Il se rendit également en Angleterre, visita Oxford, Cambridge et Londres, où il s'était livré à l'étude des grandes institutions britanniques.

Revenu au pays à la fin de l'année 1933, inscrit au barreau, il y fit ses premières armes en perdant sa première cause aux mains d'un vieux routier de la procédure, comme il y en avait tant, avant 1930, mais la leçon avait porté. Les perspectives étaient alors loin d'être encourageantes, cependant il devait faire au barreau une brillante carrière. L'un de ses premiers associés fut son condisciple de la faculté de droit, Léon Lalande, c.r., auquel devait venir s'adjoindre quelque cinq années plus tard, son frère, André Nadeau, c.r., ll.d.

Il avait conduit des causes qui eurent du retentissement, notamment en matière de droits d'auteur (Affaire Le Gouriadec), comme aussi en matière de diffamation et de libelle.

Parallèlement à sa vie d'avocat, J.-M. Nadeau a mené une carrière de professeur, d'écrivain et de conférencier, qui était bien dans la logique de son tempérament.

En 1934, Olivar Asselin fondait son célèbre quotidien montréalais, *L'Ordre*, ambitieux projet où il tentait une formule de journalisme qui ne peut guère durer que dans un grand pays métropolitain, comme le *Manchester Guardian*, l'ancien *Temps* de Paris, etc. Jean-Marie Nadeau fut de la première équipe de *L'Ordre* et il y donna, les quelque quinze ou dix-huit mois que dura l'entreprise, une chronique sinon quotidienne, à tout le moins trois fois la semaine, sur l'actualité économique. Il y publia, entre autres, une savant étude, d'abord donnée en conférence sur « Les Doctrines juridiques françaises depuis le début du XIXè siècle » .

Dès son retour d'Europe, en janvier 1934, il avait donné une première conférence sur l'Evolution du droit privé franco-canadien, que le quotidien montréalais, *Le Devoir*, avait reproduit en texte.

L'Université de Montréal l'appelait, en 1937, à la faculté des sciences sociales, et lui confiait le cours de politique économique que donnaient auparavant Edouard Montpetit et Jean Bruchési. Professeur agrégé et adjoint au directeur des études en 1940, il devenait professeur titulaire et membre du conseil de la faculté en 1945, office qu'il remplit jusqu'en 1950.

Entré, la même année (1937), à la faculté des lettres, comme chargé du cours d'histoire générale, il était passé agrégé en 1942 et il y succédait à Jean Bruchési. Sa pratique intensive du droit l'avait contraint, quelques années plus tard, à se délester de son office à la faculté des lettres, qui l'avait nommé professeur honoraire.

Le gouvernement Godbout avait décidé, en 1941, de rouvrir la Bibliothèque Saint-Sulpice, ancienne bibliothèque officieuse de l'Université de

Jean-Marie Nadeau

Montréal, et dont les collections dormaient depuis sa fermeture (1931) imposée par la crise économique. Le secrétaire de la province du temps, M. Hector Perrier, appela comme conservateur de la bibliothèque Jean-Marie Nadeau, qui, au cours des années 1942–44, remit l'institution sur pied, et réorganisa ses services. Mais peu fait par tempérament pour les procédés dilatoires, J.-M. Nadeau ne fit que passer dans l'administration.

En 1944, le gouvernement canadien l'avait nommé représentant de la province de Québec à la Commission royale d'enquête sur les coopératives au Canada, présidée par feu le juge Erroll McDougall. Cette enquête conduisit les commissaires de ville en ville et de capitale en capitale à travers toutes les provinces du pays, et jusque dans la capitale américaine. Le produit de leurs investigations a été publié dans le *Rapport de la Commission d'enquête sur les coopératives.*

J.-M. Nadeau avait publié dès lors, à part des conférences et de nombreuses contributions aux journaux et périodiques de la province, deux études majeures dont *Entreprise privée et socialisme* (Montréal, 1944), et *Horizons d'après guerre* (Montréal, 1944).

Il s'engageait, en 1944, dans la lutte politique. Il ne le savait pas encore, mais il y était entré pour n'en plus sortir. Ainsi mettait-il en application, sans la lettre peut-être, le principe formulé par le bâtonnier de Paris d'il y a un siècle (1856), Liouville, et qui n'est pas une mauvaise description du devoir du citoyen en démocratie parlementaire. « ... il faut être homme de parti...elle était sage cette loi d'une ancienne République par laquelle tout homme qui s'abstenait de prendre un parti dans les dissensions civiles, était déclairé infâme et puni comme tel. Sans cela, l'apathie des bons emporte la perte de l'Etat. Les tyrans ne demandent rien que le sommeil et la léthargie de ceux qui peuvent s'opposer à leurs desseins... » .

Son parti vaincu aux urnes en 1944, J.-M. Nadeau acceptait, à l'élection générale de la province en 1948, de briguer les suffrages populaires en son comté natal de Rouville. Il y fut défait à quelque centaines de voix. Il n'en conçut aucune amertume, se contentant de méditer avec le citoyen romain sur l'*homo mendax*, qui dit oui et fait non... Et il continua d'accumuler ses observations sur la vie publique de la province. Au congrès libéral tenu à Québec en 1951 pour le choix d'un leader, il se porta candidat à la direction du parti. Il y prononça un discours remarquable, où déjà il établissait ses positions idéologiques tant vis-à-vis du parti qu'à l'égard de la politique générale qu'il préconisait. Il n'y fut pas élu, mais son adversaire victorieux, Georges Lapalme, aujourd'hui le procureur général de la province, devait devenir l'un de ses plus fidèles amis.

Entre temps, il était passé directeur du quotidien politique montréalais *Le Canada*, dont les commanditaires décidèrent, peu après, de discontinuer la publication, à l'instar de tant d'autres organes de presse tombés sous la pression des nécessités économiques.

Organisateur du parti libéral à l'élection de 1952, c'est le moment où le parti adverse fit quasi l'unanimité des sièges à l'Assemblée législative. J.-M.

Nadeau continua ses études, dressa des plans et il fut l'un des artisans de la création de la fédération du parti libéral québecois. Il en devint chef de la commission politique, office qu'il devait remplir jusqu'à son dernier moment.

Il avait encore participé activement à la campagne de 1956. Mais dès lors, frappé en ses forces vives, il dut diminuer son activité extérieure. Après un séjour de plusieurs semaines à l'hôpital, il avait su sagement réorganiser sa vie en tenant son cabinet, à la française, partie à domicile.

Il avait encore sur le métier deux ouvrages, dont le premier, fort avancé, sur « Le Droit des compagnies », et un autre, une biographie-anthologie de l'ancien directeur de *L'Ordre*, Olivar Asselin.

Et ce n'est pas l'aspect le moins tragique de sa trop brève carrière que le dernier texte qu'il ait préparé, en sa qualité de président de la commission politique de son parti, ait été lu alors qu'il reposait en chapelle ardente, au dernier congrès libéral tenu à Montréal même. En ce texte, qui devient pour lui, une manière de testament politique, il s'était employé à définir, ou à rechercher, les termes d'un statut de la fonction publique en notre province.

On comprend que, plongé ainsi comme sans repos, dans des études aussi diverses et aussi absorbantes, et, homme d'étude avant tout, J.-M. Nadeau se soit peu dispersé dans les clubs et associations.

Il avait tenté, un moment, un expérience, qui se révèle généralement décevante, en se portant acquéreur du domaine paternel, à Saint-Césaire. Avec beaucoup d'autres, il put se rendre compte que sous notre dur climat, seul le *dirt farmer*, comme disent nos voisins d'outre 45è — ou le cultivateur travaillant de ses mains — a des chances, dans une entreprise agricole, de réaliser une proposition rentable.

Membre de diverses associations de bibliothécaires, de la Société historique de Montréal, du Club de Réforme de Montréal, de la Société des Ecrivains canadiens, de l'Ordre des Chevaliers de Colomb, il avait été élu à la Société royale du Canada en 1946. Il y avait été reçu en séance publique tenue au Cercle universitaire de Montréal. Edouard Montpetit l'y avait présenté dans une chaude allocution, et Jean-Marie Nadeau y avait traité de l'œuvre du juriste P.-B. Mignault.

Le 29 mai 1935, il avait épousé à l'église Saint-Germain d'Outremont, Pauline Mignault, fille du docteur Georges Mignault. Sa femme lui survit. Il laisse encore dans le deuil quatre fils, Pierre (époux de France Johnson), de la Société Radio-Canada; Jacques, étudiant en sciences commerciales; Jean et Michel, aux études secondaires; son père, aujourd'hui octogénaire; ses frères, Georges, Charles, et son associé professionnel, Me André Nadeau, précité, sa sœur, Françoise (épouse de François Trudel); et deux petits-enfants.

Il eut d'imposantes obsèques à son église paroissiale depuis son mariage, Notre-Dame-des-Neiges, et que célébra son condisciple et ami, le P. Emile Legault. Inhumation en son village natal de Saint-Césaire.

JEAN-JACQUES LEFEBVRE

Chester William New

1882–1960

ON AUGUST 31, 1960, Canada lost a distinguished son and the Royal Society an eminent Fellow. Chester William New died in Hamilton, Ontario, the city with which he had been identified for so many years, at the age of seventy-eight. He is mourned by his widow, the former Mildred Jury of Bowmanville, Ontario, his son, two daughters, and four grandchildren.

Born in Montreal on October 9, 1882, Chester New was brought up and went to school in Hamilton, and this early acquaintance with the steel centre was renewed in later life when McMaster University was established there. He served this university so long and so loyally—to most people he was Mr. McMaster in person—that it may surprise many to learn that it was not from there that he had obtained his B.A. He was an alumnus (1903) of the University of Toronto. His association with McMaster began when he went there in 1905 to study theology. It may also come as a surprise to many that he was an ordained minister with the B.D. degree (1907). It is true that his pastorate was a relatively short one, but Christian devotion and a lively interest in the affairs of the Baptist denomination were his to the very end: he was a lifelong deacon of his church and until his last illness he was serving actively, one might even say intensively, on important committees of the Baptist Convention of Ontario and Quebec.

It is as a scholar, however, that he will chiefly be remembered by the Royal Society. Like that other great Canadian, George Wrong, Chester New was a cleric turned historian. After some graduate work at Oxford and in Germany and still more at Chicago, where he graduated Ph.D., he began his teaching career at Brandon College in 1913 and in 1920 moved to McMaster University. He served as the head of the History Department there for over thirty years until his retirement in 1951; and of the many hundreds of students who attended his classes during that period it is safe to say that not one will fail to remember him with affection and respect, affection for the catholicity and sincerity of his interest in anything to do with student life (and the mannerisms with which it was expressed), and respect for his obvious mastery of his discipline and for the distinction of his publications. Admittedly the immense pains he took with all his students and the care he lavished upon their essays and other written work restricted his output. But his production, if not enormous, was of the highest quality. His youthful study of Tudor England (1915) was followed in 1929 by his definitive biography of Lord Durham, published by the Oxford University Press, which won him not only immediate acclaim in this country but also the gold medal of the Royal Empire Society in London and has now become a classic. His volume on Lord Brougham, which had reached proof-stage (it, too, on the presses of Oxford) at the time of its author's death, is a

work of painstaking research and the utmost competence. His students were well aware of the lucidity of his pen: how could they not be, seeing that generations of them had been brought up on the history textbooks he prepared for the Ontario Department of Education?

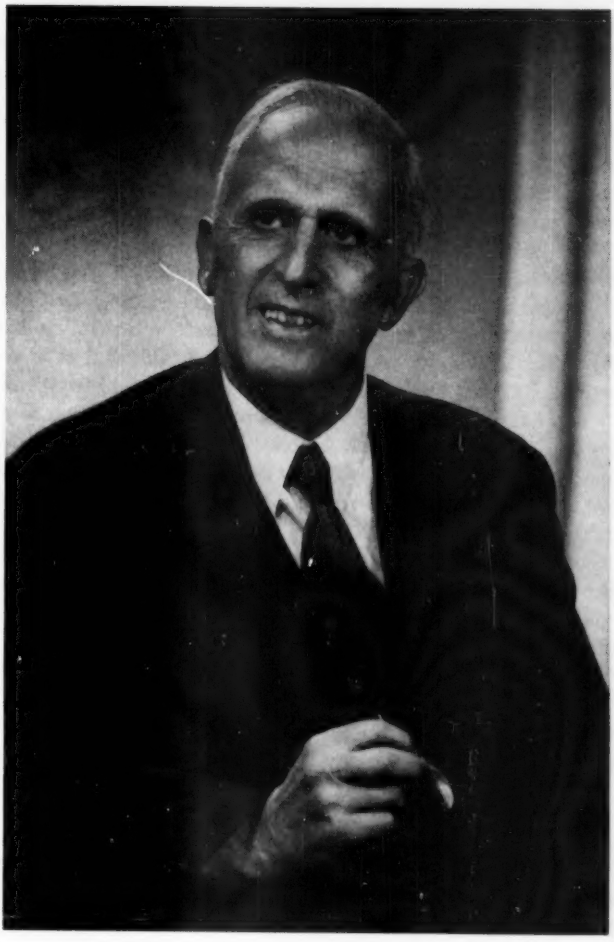
Honours, needless to say, came his way. He was elected Fellow of the Royal Society of Canada in 1937 and of the Royal Historical Society in 1938. He was President of the Canadian Historical Association during 1936–37, and his vigorous participation in the activities of the American Historical Association led to his being made a member of the Editorial Board of the *Journal of Modern History* in 1942.

What everyone who knew him found particularly attractive was his fresh and infectious enthusiasm. He threw himself into whatever he undertook with vim, keenness, and zest. And this was not merely in matters connected with church and classroom. He was passionately interested in all forms of sport. He represented McMaster for years on the Intercollegiate Athletic Union and an annual harrier race has been established at the university in his honour. He served on the executive of the Hamilton Olympic Club and on the board of management of the Hamilton Municipal Swimming Pool, and he had an uncanny and encyclopaedic memory for athletic facts and figures that could have netted him a fortune on any honestly conducted quiz show. It was no surprise to learn that during his last days, even when in an oxygen tent, he still had a radio by his bedside bringing him the latest news from the Olympics in Rome and from the ball parks of North America. His was not a rugged physique, and consequently football and similar "contact" sports were not for him: but he was a better than average curler and swimmer.

From his early undergraduate days he devoted no little attention to the public life of his native land, and here his interest was anything but purely academic. He was an official delegate at the Conservative Convention in Winnipeg in 1942 and was a member of the committee that drew up the party platform, and in the 1945 federal election he contested the West Hamilton seat. His defeat was of the narrowest and came at the hands of a Cabinet Minister in the days of Liberal landslides.

His memory will long be cherished at McMaster and much further afield for his professional eminence, for his intellectual versatility, for his complete freedom from meanness of any kind, and perhaps not least for his amusing foibles. His absentmindedness became a campus legend and not all the tales about it were apocryphal. *Quis desiderio sit modus tam cari capitis?*

E. T. SALMON



CHESTER WILLIAM NEW

Donald Strathearn Rawson

1905–1961

THE death on February 16, 1961, of Professor Donald S. Rawson ended the career of a limnobiologist of national and international fame, and deprived the University of Saskatchewan of a valued Head of the Department of Biology.

Donald Rawson was born in Claremont, Ontario, on May 19, 1905, of Canadian parents. He entered the University of Toronto in 1922, selecting limnology as his field of specialization. He showed outstanding ability as a student and was awarded the doctorate at the age of twenty-four. At the University of Toronto he came under the influence of such able men as E. M. Walker, A. G. Huntsman, W. Harkness, and J. R. Dymond. These associations had a lasting effect upon him and early kindled that great love for the biology of the outdoors in which he was to make such outstanding contributions in later life. Following his graduation he accepted a call from the University of Saskatchewan and in 1928 joined the staff of the Biology Department. In 1949 he was made head of the department.

Dr. Rawson was married to Hildred Patton, B.A. (Toronto) in 1932 and is survived by his widow, by two sons (Bruce, President of NFCUS in Ottawa; and Eric, a student of Physics in the graduate school at Toronto), and one daughter (Mary, Mrs. E. A. Tollefson of Saskatoon).

Dr. Rawson's studies in limnology fall into distinct periods. From 1928 to 1934 his interest was concentrated on the lakes of the newly established Prince Albert National Park. This work involved physico-chemical, biological, and fisheries studies, and specific experiments in fisheries management. In the period 1935–41 he carried on extensive research in the National Parks of the Canadian Rockies and at Riding Mountain National Park in Manitoba. Although all these investigations had as their primary aim the collection of limnological information to be applied in fisheries-management problems, contributions of fundamental significance also resulted. As a scientist he spanned the gap between the theoretical and the applied.

In 1942 he began work on the large northern lakes—Reindeer, Athabaska, and Great Slave, work that brought him fame far beyond the borders of his native Canada. After 1947 he devoted most of his attention to investigations centring around Lac la Ronge and Amisk Lake in the Churchill drainage. Through all these studies and some sixty stimulating publications, the northern Canadian lakes have become as familiar to freshwater biologists all over the world as any of the "classic" lakes of limnology.

Although all his studies were carried on in Canada, in outlook he was international. He travelled widely in the United States and in Europe and became thoroughly familiar with leading limnological investigation abroad. A bond of friendship with other scientists was quickly established and many of them will long remember the hospitality of the Rawson home.

Practical aspects of research attracted his attention. Thus, following his extensive limnological investigations in the province he was instrumental in setting up a sound fisheries research programme in Saskatchewan under the jurisdiction of the Department of Natural Resources. He also played an important part in the founding of the Canadian Society of Wildlife and Fishery Biologists.

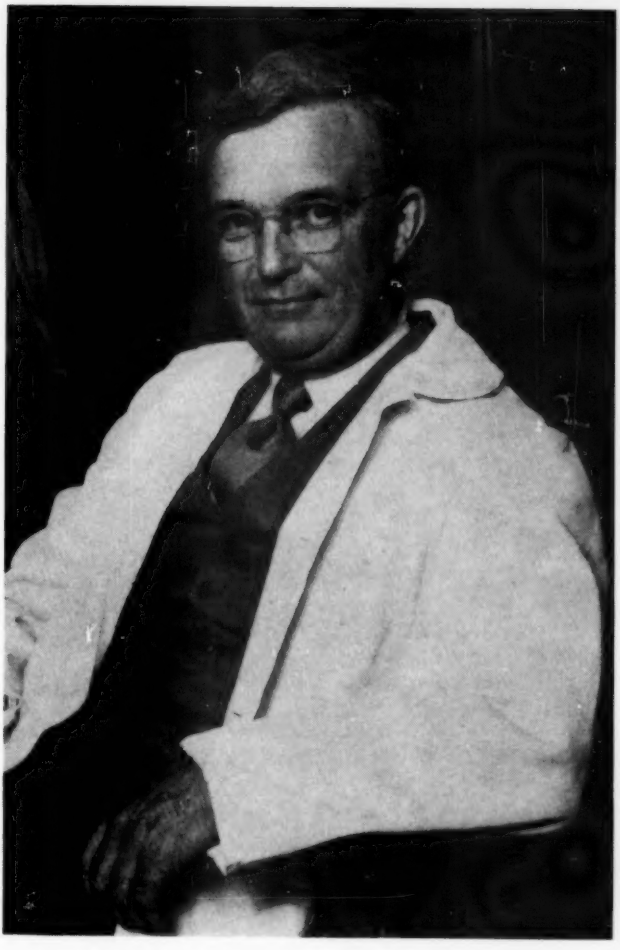
But the "Doc," as he was affectionately called by his graduate students, had greatness in other fields. He was one of those rare administrators who can be efficient and firm yet at the same time tolerant and understanding. He was a builder, and the stately W. P. Thompson Biology Building on the campus of the University of Saskatchewan is to a large extent his creation, together with the strong department it houses. However, Dr. Rawson's monument is not one of stone: it is a living one that exists in the many young limnobiologists to be found in Canada from the Pacific to the Atlantic, and some beyond its borders in foreign lands. These men will long remember the pleasant and stimulating experiences which they shared with him in Canada's northland, fully realizing that their lives, in one way or another, were moulded by the splendid example he set before them.

We must also refer to a more personal side of his life. As an undergraduate of the University of Toronto, Donald Rawson became interested in wrestling and his usual striving for excellence soon made him a champion. This interest in wrestling stayed with him throughout his life, and at the University of Saskatchewan he coached many a team to a Western Intercollegiate championship. But again Don Rawson was more than a great athlete. He was above all a good sportsman and a sincere friend of young men. The athletes who came under his influence are better men today for it.

Many honours came to Donald Rawson in his lifetime. He was President of the Limnological Society of America, President of the Canadian Conservation Association, Director of the Fisheries Research Board of Canada, a member of the Royal Commission on Fisheries for Saskatchewan, and a fellow of the Royal Society of Canada.

At the time of his death Dr. Rawson was at the very peak of his scientific and teaching career. It is difficult to realize that one so vital has gone. In the words of J. R. Dymond "Don Rawson's death will mean an irreparable loss to science in Canada, especially in the West, but it is as a happy and helpful human being that many of us will miss him most."

J. G. Rempel



DONALD STRATHEARN RAWSON

APPENDIX D

TITLES AND ABSTRACTS OF PAPERS PRESENTED AT THE ANNUAL MEETING

Programme of Papers
Programme des Travaux

SECTION I. LITTÉRATURE, HISTOIRE, SCIENCES SOCIALES, ETC.

Le lundi, 5 juin

8 h. 30 — Inscription : Lobby, McConnell Engineering Building.

10 h. — Réunion générale de la Société : Auditorium, Physical Sciences Centre.

10 h. 30 — Colloque général : Auditorium, Physical Sciences Centre.

2 h. — Réunion de la Section : Salle 122, McConnell Engineering Building.

(1) Discours du président, M. Antoine Roy, m.s.r.c.
(2) Discussion des affaires courantes.
(3) Présentation de travaux.
  (*a*) Enseigner la Géographie pour elle-même, par Benoît Brouilette, m.s.r.c.
  (*b*) Au Jardin de ma jeunesse, par Gustave Lanctôt, m.s.r.c.
  (*c*) Les Canadiens et les universités étrangères, par Jean-Jacques Lefebvre, m.s.r.c.

Le mardi, 6 juin

9 h. 30 — Réunion conjointe des sections I et II : (sous la présidence de MM. Antoine Roy et F. R. Scott) « Le Problème de la population au Canada » — Salle 204, McConnell Engineering Building.

(1) Pierre Dagenais, m.s.r.c.
(2) Nathan Keyfitz, m.s.r.c.

2 h. — Réunion de la section

(1) Colloque sur le Centenaire de l'Ecole littéraire de Québec. Président: M. Guy Sylvestre, m.s.r.c.
  (*a*) Tableau de la littérature et de la vie intellectuelle en 1860 : Crémazie, Buies et autres, par Léopold Lamontagne, m.s.r.c

Section I

(*b*) Notre littérature au XX[e] siècle, par Roger Duhamel, m.s.r.c.

(*c*) Bibliographie de la poésie canadienne-française de 1860 à 1961, par Antoine Roy, m.s.r.c.

(2) Présentation de travaux

(*a*) L'Ecole littéraire de Montréal (1895–1940) et la rivalité Québec-Montréal, par Mgr Emile Chartier, m.s.r.c.

(*b*) Jean et Augustin De Lisle, notaires et amateurs de science, par Léon Lortie, m.s.r.c.

Le mercredi, 7 juin

9 h. 30 — Réunion de la Section : Salle 122, McConnell Engineering Building.

(1) Discours de réception du gagnant de la médaille Chauveau pour 1961—M. Gérard Malchelosse.

(2) Présentation de travaux

(*a*) Anniversaires tragiques, par Mgr Olivier Maurault, m.s.r.c.

(*b*) Brouage, par Gérard Morisset, m.s.r.c.

(*c*) Les Conséquences de l'évolution démographique sur l'assurance-vie au cours du dernier siècle, par Gérard Parizeau, m.s.r.c.

2 h. — Réunion de la Section : Salle 122, McConnell Engineering Building.

(1) Discussion des affaires courantes.

(2) Présentation de travaux.

(*a*) Urgel-Eugène Archambault (1834–1904), par Louis-Philippe Audet, m.s.r.c.

(*b*) Préoccupations économiques du Séminaire de Québec (1800–1910), par Mgr Arthur Maheux, m.s.r.c.

(*c*) Quelques Notes sur la diffusion du protestantisme parmi les Canadiens français au milieu du dix-neuvième siècle, par le R. F. Robert Sylvain, é.c., présenté par M. Maurice Lebel, m.s.r.c.

(*d*) La Condition littéraire est-elle soumise aux pressions démographiques ? par Charles-Marie Boissonnault, m.s.r.c.

(*e*) Pour un Centre d'études Nordiques, par Louis-Edmond Hamelin, présenté par Maurice Lebel, m.s.r.c.

4 h. — Réunion générale de la Société : Auditorium, Physical Sciences Centre.

5 h. — Réunion du conseil : Salle du Conseil, Arts Building.

1. Tableau de la littérature et de la vie intellectuelle en 1860. Par Léopold Lamontagne, m.s.r.c.

Du chaos qui a suivi la conquête de 1760 et des crises parfois violentes qui ont accompagné l'accouplement de deux races rivales est née la nation canadienne au milieu du XIX[e] siècle. Peu à peu, les Canadiens français se sont redressés (Papineau, Lafontaine, Garneau, Parent) et ont pris conscience de la place qu'ils pouvaient occuper dans ce ménage. Essor économique, religieux, social et littéraire des années 1860.

2. Notre littérature au XX[e] siècle. Par Roger Duhamel, m.s.r.c.

Le renouveau apporté par l'Ecole littéraire de Montréal — les partisans du régionalisme et de l'exotisme — la génération de 1930 — les œuvres et tendances de l'après-guerre.

3. Bibliographie de la poésie canadienne-française de 1860 à 1961. Par Antoine Roy, m.s.r.c.

4. L'Ecole littéraire de Montréal (1895–1940) et la rivalité Québec — Montréal. Par Mgr Emile Chartier, m.s.r.c.

Cette étude expose l'un des aspects les plus curieux d'une rivalité amorcée par la nature elle-même. Les poètes de Montréal, par leur double doctrine : suppression de la poésie patriotique et oratoire, recours aux formes récentes crées par les nouvelles Ecoles de France, prolongeaient à leur façon la rivalité originelle entre la capitale et la métropole du Québec. L'auteur fait l'histoire des principaux poètes de l'Ecole montréalaise.

5. Urgel-Eugène Archambault (1834–1904). Par Louis-Philippe Audet, m.s.r.c.

Personnage considérable dans l'histoire scolaire de Montréal. Il fut successivement ou concurremment directeur de l'Académie Commerciale catholique, directeur et surintendant des écoles de la Commission scolaire de la métropole, fondateur et premier principal de l'Ecole Polytechnique, visiteur des Ecoles, puis surintendant local. Il fut l'artisan principal de la coordination des écoles de Montréal, coordination qui se réalisa au prix de nombreuses difficultés. Ses initiatives pédagogiques furent nombreuses et son influence s'exerca même sur le plan provincial.

6. Enseigner la Géographie pour elle-même. Par Benoît Brouillette, m.s.r.c.

Doit-on enseigner la géographie, au primaire et au secondaire, parmi les sciences dites sociales ou comme une matière autonome ? Une enquête internationale, effectuée en 1959–60, montre les avantages et les inconvénients des deux méthodes. Le rapporteur base son jugement sur les données psychologiques qui permettent d'adapter cet enseignement au niveau mental des élèves.

Section I

7. Au Jardin de ma jeunesse. Par Gustave Lanctôt, m.s.r.c.

Petite suite de poèmes d'inspirations diverses et de dates indéfinies qui peuvent contribuer à représenter une certaine période de tendances et de formules en pleine voie d'évolution.

8. Les Canadiens et les universités étrangères (1760–1867). Par Jean-Jacques Lefebvre, m.s.r.c.

On a soutenu trop longtemps qu'aux lendemains de 1760 à peu près toute vie intellectuelle a été tarie et qu'une sorte de nuit du haut moyen âge s'abattit sur la province et la vallée du Saint-Laurent. Rien de plus inexact et de plus éloigné des faits. Ici suit une petite démonstration à l'aide de multiples exemples que partout et dans les centres les plus inattendus, la vie de l'esprit continua de rayonner au pays de Maria Chapdelaine avant la lettre.

9. Jean et Augustin De Lisle, notaires et amateurs de science. Par Léon Lortie, m.s.r.c.

Jean De Lisle vint au Canada en 1796. Il fut notaire et arpenteur. Il rédigea des cahiers d'expériences de physique qu'il avait exécutées pour son plaisir; il décrit, entre autres, un moyen de déterminer la densité des corps plus légers que l'eau. Le plus jeune de ses fils, Augustin-Stanislas (1802–65) fut notaire lui aussi et botaniste amateur. Il a rédigé plusieurs cahiers de botanique et ne réussit jamais à faire publier un ouvrage sur les plantes d'Amérique.

10. Anniversaires tragiques. Par Mgr Olivier Maurault, m.s.r.c.

Il y a trois cents ans, en 1661, la Compagnie de Saint-Sulpice de Montréal perdait deux de ses membres, massacrés par les Iroquois : M. Jacques Le Maistre et M. Guillaume Vignal. Le premier fut décapité, à la ferme Saint-Gabriel (Pointe Saint-Charles), le 29 août 1661; le second fut attaqué à l'île à la Pierre en face de Montréal, mortellement blessé et *mangé*, à la Prairie de la Magdeleine, le 27 octobre 1661.

Les deux victimes étaient économes de la Compagnie et travaillaient tous deux à la construction du premier séminaire, rue Saint-Paul.

11. Brouage. Par Gérard Morisset, m.s.r.c.

12. Les Conséquences de l'évolution démographique sur l'assurance-vie au cours du dernier siècle. Par Gérard Parizeau, m.s.r.c.

En s'améliorant, la situation démographique a entraîné une baisse substantielle de la mortalité au Canada, comme dans le reste du monde. Comme conséquence, le coût de mortalité en assurance sur la vie est devenu sensiblement inférieur aux prévisions des tables de mortalité. Cela a permis aux assureurs de faire de très abondantes économies et ainsi de compenser partiellement une baisse substantielle de revenus correspondant au rendement décroissant de leur portefeuille en période d'abondance de l'argent.

13. Préoccupations économiques du Séminaire de Québec (1800–1910). Par Mgr Arthur Maheux, m.s.r.c.

Les abbés Jérôme Demers, John Holmes, Edward Horan, Ovide Brunet, Clovis Kemner Laflamme ont contribué par leur enseignement, par leur activité publique à la vie économique des Canadiens français.

14. Quelques Notes sur la diffusion du protestantisme parmi les Canadiens français au milieu du dix-neuvième siècle. Par le R. F. Robert Sylvain, é.c. Présenté par Maurice Lebel, m.s.r.c.

En octobre 1834, arrivée à Montréal du pasteur suisse Henri Olivier. Il ne réussit qu'à détacher trois familles de l'Eglise catholique. L'année suivante, il est remplacé par ses compatriotes Henriette Feller et Louis Roussy. Etablissement de la Mission de Grande-Ligne. Fondation de la *French Canadian Missionary Society*. Rôle non négligeable sur la diffusion du protestantisme au Canada français de l'*American and Foreign Christian Union*.

15. La Condition littéraire est-elle soumise aux pressions démographiques? Par Charles-Marie Boissonnault, m.s.r.c.

L'évolution des langues sous l'influence du nombre est démontrée par l'histoire. Une langue reste pauvre aussi longtemps que le peuple qui la parle est peu nombreux, mais à mesure que la population s'accroît, elle s'enrichit. Il est impossible de dire quelle sera la langue de la province de Québec dans deux siècles. On peut affirmer cependant de façon absolue que ce ne sera pas le français prôné à l'heure présente, pas plus que la langue de Simone de Beauvoir n'est celle de François Villon. Alors viendra un Calvin, un Dante, un Shakespeare ou un Rabindranath Tagore qui donnera une forme littéraire à cette langue.

16. Pour un Centre d'études Nordiques. Par Louis-Edmond Hamelin. Présenté par Maurice Lebel, m.s.r.c.

Nature et direction — fonction — programme. A Québec. Dans les Territoires.

SECTION II. ENGLISH LITERATURE, PHILOSOPHY, SOCIAL SCIENCES, ETC.

Monday, June 5

10.00 A.M.—General Meeting of the Society.

10.30 A.M.—Society Symposium.

2.00 P.M.—Business Meeting of the Section.

2.15 P.M.—Section Meeting: *Chairman*, G. E. Wilson, F.R.S.C.
Presidential Address—"The Changing Constitution." By F. R. Scott, F.R.S.C.

3.15 P.M.—Section Meeting: *Chairman*, F. R. Scott, F.R.S.C.
Address of the President for 1960—"Philosophy and Theology: A Contrast." By the Reverend G. B. Phelan, F.R.S.C.

Tuesday, June 6

9.30–12.30 P.M.—Symposium on Canadian Demography—Sections I and II. *Joint Chairmen*, Antoine Roy, m.s.r.c. and F. R. Scott, F.R.S.C.

The symposium will comprise a panel including Professor Pierre Dagenais and Professor Nathan Keyfitz, F.R.S.C. Associates of Professor Dagenais and Professor Keyfitz will be respectively Professor Guy Rocher and Professor A. R. M. Lower, F.R.S.C.

Les professeurs Pierre Dagenais et Nathan Keyfitz prendront part au colloque. Les assisteront dans la discussion Messieurs les professeurs Guy Rocher et A. R. M. Lower, F.S.R.C.

2.00 P.M.—Concurrent Sessions.

(*a*) Canadian History: *Chairman*, George F. G. Stanley, F.R.S.C.

(*b*) Ancient History and Art: *Chairman*, A. G. Bailey, F.R.S.C.

Canadian History

2.00 P.M.—Inalienable Rights *versus* Expendable Privileges in Section 93 of the B.N.A. Act. By C. B. Sissons, F.R.S.C.

2.30 P.M.—Rondino on a Theme by Shortt. By J. L. McDougall. Presented by C. P. Stacey, F.R.S.C.

3.30 P.M.—Some Historical Evidence on the Earlier Physiography of the North American Prairies. By F. G. Roe, F.R.S.C.

4.00 P.M.—A Quarter-century of Minor Canadian Poetries. By Watson Kirkconnell, F.R.S.C. By title.

ANCIENT HISTORY AND ART

2.00 P.M.—Two Expeditions into the Jordanian Desert. By F. V. Winnett, F.R.S.C.

2.30 P.M.—Folk Proverbs of the Ancient East. By R. B. Y. Scott, F.R.S.C.

3.00 P.M.—Early Canadian Art: Its French and English Backgrounds (illustrated by slides). By Robert Hubbard. Presented by George F. G. Stanley, F.R.S.C.

3.30 P.M.—A New Vision of Evolution: The Ideas of Teilhard de Chardin. By T. A. Goudge, F.R.S.C.

Evening—Dinner—Presentation of Medals and Presidential Address.

Wednesday, June 7

9.30 A.M.—Session on Modern Psychology. *Chairman*, J. D. Ketchum, F.R.S.C.
The Emergence of Modern Ideas. By G. A. Ferguson.
The Experimental Psychologist: Is There a Reason for his Existence? By R. B. Bromiley.
Social Psychology and Social Implications. By J. M. Blackburn.
The Meaning of Objective Psychology. By D. O. Hebb, F.R.S.C.
(Messrs. Ferguson, Bromiley, and Blackburn presented by J. D. Ketchum, F.R.S.C., and D. O. Hebb, F.R.S.C.)

2.00 P.M.—Business Meeting of Section.

4.00 P.M.—General Business Meeting.

PROGRAMME FOR THE 1961 JOINT SYMPOSIUM OF SECTIONS III, IV, AND V

ON

Possibilities of Colonization of North Canada

Chairman: R. POMERLEAU, F.R.S.C.

Tuesday, June 6

2.00 P.M.—Opening remarks by Chairman.

2.05 P.M.—E. W. Humphrys, "Possibilities of Heat and Light from Atomic Energy and other Sources."

2.30 P.M.—Discussion.

2.40 P.M.—J. F. Henderson, F.R.S.C., and K. Buck, "Role of Mineral Resources in the Development of North Canada."

3.05 P.M.—Discussion and coffee break.

3.25 P.M.—M. J. Dunbar, F.R.S.C., "Present and Future Living Resources in Northern Canada."

3.50 P.M.—G. Malcolm Brown, "Man in the North."

4.15 P.M.—Discussion.

4.25 P.M.—Trevor Lloyd, "Possibilities of Colonization of North Canada." General conclusions.

4.50 P.M.—Closing Remarks by Chairman.

SECTION III. MATHEMATICAL, CHEMICAL, AND PHYSICAL SCIENCES MATHEMATIQUES, CHIMIE ET PHYSIQUE

Saturday, June 3

9.00 A.M.—Mathematics (jointly with the Canadian Mathematical Congress)

Sunday, June 4

8.00 P.M.—Joint business meeting of Sections III, IV, and V.

Monday, June 5

10.00 A.M.—General meeting of the Society.

10.30 A.M.—Society Symposium.

2.00 P.M.—Presidential Address and the 1961 Tory Medal Address.
"The Role of Star Clusters in Our Understanding of the Galaxy," by Helen S. Hogg, F.R.S.C.
"Star Clusters and the Scale of the Galaxy," by R. M. Petrie, F.R.S.C.

3.30 P.M.—Business meeting of Section III.

Tuesday, June 6

9.30 A.M.—Technical Sessions.

2.00 P.M.—Joint Symposium with Sections IV and V on "Possibilities of Colonization of North Canada." *Chairman*: R. Pomerleau, F.R.S.C., Guest speakers, E. W. Humphrys, J. F. Henderson, F.R.S.C., K. Buck, M. J. Dunbar, F.R.S.C., G. Malcolm Brown, and Trevor Lloyd.

Wednesday, June 7

9.30 A.M.—Technical Sessions.

2.00 P.M.—Business meeting of Section III.

4.00 P.M.—General meeting of the Society.

5.00 P.M.—Meeting of the Council.

MATHEMATICS—MATHEMATIQUES

JOINTLY WITH THE CANADIAN MATHEMATICAL CONGRESS

Saturday, 9.00 a.m.

1. Some enumeration problems in the plane. By W. T. Tutte, F.R.S.C.

Problems of enumeration, usually the enumeration of graphs of specified kinds, are prominent in combinatorial mathematics. F. Harary, in his survey of the present state of the subject, remarks that no one has made "even a successful beginning" in the problem of enumerating planar graphs. This paper includes an account of such a successful beginning. It enumerates the simplicial dissections, without diagonal edges, of a 2-cell which correspond to a given dissection of the boundary. The results, together with the assumption that almost all simplicial dissections of the 2-sphere are unsymmetrical, leads to an asymptotic formula for the number of simplicial dissections of the 2-sphere into $2n$ triangles.

2. Orthogonal mappings of groups. By Diane Johnson and N. S. Mendelsohn, F.R.S.C.

Let G be any finite loop. A mapping ϕ of G onto G is called an orthogonal mapping if for every x and y in G, $x(x\phi)^{-1} = y(y\phi)^{-1}$ implies $x = y$; where $x\phi$ is the image of x under the mapping. If G is a group then orthogonal mappings of G exist except in the case where G is of even order with a cyclic Sylow 2-subgroup. Orthogonal mappings are related to the problem of computing sets of mutually orthogonal latin squares. For dihedral groups there is a simple procedure for listing all orthogonal mappings. This is illustrated by computations for the cases $n = 8$ and $n = 12$.

3. Topological H-surfaces. By H. G. Helfenstein. Presented by P. Scherk, F.R.S.C.

H-spaces were introduced by J.-P. Serre (Ann. Math., **54** [1951], 425–505). By a (topological) surface we mean a connected 2-dimensional manifold with a countable basis for its open sets. We prove: Every H-surface is homeomorphic to a plane, cylinder, torus, or Moebius strip. The first three types can be given Abelian topological group structures. The Moebius strip can be made into a commutative topological semi-group with homotopy unit and homotopy inversion, but not into a topological group.

4. On some methods for computing the roots of polynomials. By James Lucien Howland. Presented by R. L. Jeffery, F.R.S.C.

Numerical methods for the solution of polynomial equations may be obtained by expressing these equations in the form $P_n(\lambda) = \det(A - \lambda B) = 0$ and developing new methods or adapting available methods for the associated characteristic value-vector problem $A\mathbf{x} = \lambda B\mathbf{x}$. In the cases considered, A, B are real, symmetric matrices, easily obtained from the coefficients of $P_n(\lambda)$. One such method is shown to be just the Newton-Raphson iteration for $P_n(\lambda)$; and several other methods are discussed. In each case, sequences of vectors U_i are constructed in such a way that the generalized Raleigh quotient

$$\lambda_i = \frac{(U_i\, A\, U_i)}{(U_i\, B\, U_i)}$$

approaches a root of $P_n(\lambda)$.

5. An alternative to the epsilon-delta technique. By A. H. Lightstone. Presented by R. D. James, F.R.S.C.

The purpose of this note is to present a definition of the mathematical concept "limit of a sequence" in meaningful terms easily grasped, so that this concept—the unifying idea of Calculus—can be introduced at an elementary level without loss of precision.

Taking advantage of the decimal notation, the limit of a sequence is expressed in terms of two families of unary operators on sequences, $\{B_k | k$ is a natural number$\}$ and $\{R_k | k$ is a natural member$\}$, where $B_k(a_n)$ is (a_{n+k}) and $R_k(a_n)$ is (b_n) where b_n is obtained from a_n by rounding off a_n to k decimal places. The definition of $\lim(a_n)$ is as follows:

$$\lim(a_n) \text{ is } A \text{ if } \forall\ p\ \exists\ q(B_q R_p(a_n) \text{ is } R_p(A)).$$

6. On the history of a differential equation first studied by Descartes. By C. J. Scriba. Presented by H. S. M. Coxeter, F.R.S.C.

Descartes, in his *Géometrie* of 1637, gave a rule how to find the tangent to certain classes of functions. In the following year F. Debeaune presented the inverse problem to the mathematical public: Given the subtangent t (where, in modern notation, $y/t = dy/dx$) find a rule to determine the function $(y = f(x))$. One of his examples $(y/t = (x - y)/a)$ was discussed in 1639 by Descartes, who considered the point of tangency as the limiting position of the point of intersection of two finally coinciding tangents. The problem was later treated by Wallis, Leibniz, L'Hospital, and Joh. Bernoulli I. It also appeared in several textbooks.

7. Concerning commutativity in higher dimensions. By M. W. Al-Dhahir. Presented by H. S. M. Coxeter, F.R.S.C.

Let $S_n (n > 2)$ be a projective n-space defined (synthetically) over a division ring R. Given an $(n - 3)$-space in general position with a pair of skew lines, there exists a unique line cutting them all. Utilizing this fact, the following results are obtained. If, in S_3, a skew hexagon is inscribed in a pair of skew lines, then the three lines determined by each pair of its opposite sides and an arbitrary point are coplanar if and only if R is commutative. A "small" form of this theorem is proved without commutativity. Similar criteria are obtained in S_4 and S_5.

8. Mathematical techniques in value engineering and management decision-making. By Carlos Fallon. Presented by G. de B. Robinson, F.R.S.C.

Mathematics in engineering has been limited to the interpretation of purely physical phenomena, with the result that many engineers lack the mathematical tools for the management aspects of their profession.

Value engineering strives to apply the precise techniques of science and engineering to those areas of evaluation, programming, and decision-making which have heretofore been governed by intuition. In design, development, and production, value engineering aims to achieve the necessary performance at minimum cost in available resources. The techniques of modern mathematics are being successfully utilized in industry to achieve both ends.

9. On perfectly semi-associative and completely semi-associative systems. By Volodymyr Bohun-Chudyniv. Presented by G. de B. Robinson, F.R.S.C.

ASTRONOMY—ASTRONOMIE

Tuesday, 9.30 a.m.

1. Preliminary Report on the Victoria Spectroscopic Observations of Distant B Stars. By R. M. Petrie, F.R.S.C.

The programme extends the work on galactic rotation and galactic structure to distances about twice those covered by the earlier studies of Plaskett and Pearce. The general purpose is to study the motions of stars and interstellar material in order to increase our knowledge of galactic dynamics. During the past fifteen years, 2330 single-prism spectrograms of 575 stars have been obtained. Radial velocities of the stars, and of the interstellar material, have been measured. An analysis of the radial velocities shows that double stars are very common, about one-half of the B stars on the programme exhibiting variable velocity.

2. Methods for Computing Theoretical Stellar Spectra. By Anne B. Underhill. Presented by R. M. Petrie, F.R.S.C.

In order to interpret spectra from early-type stars and to predict the far ultra-violet spectrum of these objects it is necessary to construct a numerical analogue of a stellar atmosphere using physical theory of the interaction between radiation and atoms under stellar conditions. Then this model of a stellar atmosphere may be used to predict spectral features of interest. This paper describes how this problem may be solved using an electronic computer and presents some results. Although this problem is straightforward in concept, much numerical work is required to complete the analysis. It is essential to use high-speed computing equipm

3. Line Intensities in Spectra of Selected *A*- and *F*-Type Stars. By K. O. Wright, F.R.S.C.

The International Astronomical Union has initiated a programme relating to the intercomparison of line intensities measured in the spectra of a few selected stars obtained at different Observatories. For this purpose, high-dispersion spectra of the stars γ Geminorum, *A*0 IV; θ Leonis, *A*2, V; 68 Tauri, *A*2 V; 15 Vulpeculae, *A*5 p; σ Bootis, *F*2 V; and α Canis Minoris, *F*5 IV–V were obtained at the Dominion Astrophysical Observatory. In a preliminary study of the atmospheres of these stars, line intensities in the region λλ 3900–4500 have been combined with *f*-values for the elements calcium, titanium, manganese, and iron to derive curves of growth and hence excitation and ionization temperatures. The latter range from nearly 10,000° K for the early *A*-type stars to about 5000° K for the *F*-type stars.

4. Photometric and Spectrographic Observations of the Eclipsing System, SZ Piscium. By J. F. Heard, F.R.S.C.

Photoelectric observations of the light of SZ Piscium and observations of its spectrum are being continued. Variations in the period are strongly suggested, and there is evidence of debris within the system causing irregular variations of light outside of eclipse. The principal interest of the system lies in the fact that the larger, cooler star is the more massive, a circumstance which is to be expected on evolutionary grounds but which is not encountered in other eclipsing systems of the type of SZ Piscium.

5. Diffusion Effects Observed in the Spectrum of a Geminid Meteor. By Ian Halliday. Presented by C. S. Beals, F.R.S.C.

The spectrum of a bright Geminid meteor photographed at Meanook, Alberta, on December 13, 1960, exhibits interesting peculiarities. The meteor was flickering in brightness at rates of about 100 to 300 cycles per second. A prominent wake spectrum, due to radiation emitted up to 0.03 second after the passage of the meteor, is observed in the gaps caused by a rotating shutter in front of the camera. At low meteoric heights, near 60 km, the wake lines are clearly split into two components. The splitting is not due to Doppler effects or to a splitting of the meteoroid, but is attributed to a thin, hollow cylinder of luminous material expanding outward from the meteor path.

6. The Luminosity Functions of Galactic Star Clusters. By Sidney van den Bergh. Presented by J. F. Heard, F.R.S.C.

The luminosity functions of a number of galactic star clusters have been obtained from plates taken with the 48-inch Schmidt telescope on Palomar Mountain. The data show that galactic star clusters contain fewer very faint stars than does the general stellar population in the vicinity of the sun. If it is assumed that the luminosity function of star clusters is similar to the present luminosity function of star creation then faint stars are now being created with a lower frequency than when the galaxy was still young. However, the possibility that the luminosity function of star clusters differs from the general luminosity function of star creation cannot yet be excluded.

7. A Detailed Hydrogen Line Survey of the Auriga Region. By J. L. Locke, J. A. Galt, and C. H. Costain. Presented by C. S. Beals, F.R.S.C.

A study has been made of the neutral hydrogen in the region of the I Auriga stellar association. The observations were made at the Dominion Radio Astrophysical Observatory using the 84-foot telescope which has a beamwidth of 0°.6 at 1420 Mc/s. Drift scans at constant velocities with respect to the local standard of rest were taken at 4.2 km/sec intervals near the velocity of the association.

The results are presented in the form of contour maps of brightness temperature at each velocity for the region $l = 130°$ to $160°$, $b = \pm 10°$.

8. The Calibration of Argon Discharge Tubes for Use as Secondary Standards of Noise in Radio Astronomy. By J. Duncan McNeill. Presented by Helen S. Hogg, F.R.S.C.

The radio-frequency noise power of a Bendix 6357/TD-11 argon discharge tube in an Airborne Instruments Laboratory type 70 A mount was measured at a frequency of 320 mcs by comparison with the noise power of a high temperature (800° K) thermal load. The noise output was found to vary from 11,800° K at a discharge current of 150 ma to 8,800° K at a current of 250 ma. The probable error is ±1.1 per cent. Two TD-40 tubes were compared with the TD-11 and found to have the same output to within 3 per cent over the same current range.

9. An Automatic Guider for the Solar Telescope of the Dominion Observatory. By V. Gaizauskas. Presented by C. S. Beals, F.R.S.C.

Direct photoelectric recording of the spectrum of solar features of small angular dimensions makes severe demands on the tracking accuracy of the telescope drive system. Such observations are also hampered by wind shaking the instrument and by the poor "seeing" conditions that usually prevail near ground level during the day. A servo system has been built to reduce these difficulties by automatically controlling the position of the solar image formed by the coelostat of the Dominion Observatory.

Tests show that guiding errors introduced by the telescope drive system and atmospheric refraction are eliminated, but that the compensation for image fluctuations during wind shake and poor "seeing" is limited by the large inertial load presented by the telescope mirror to the servo system.

A description is given of the role of the guiding system in the operation of an automatic recording solar magnetograph.

10. A Canadian Standard of Time and Frequency. By Malcolm M. Thomson, Barbara A. Dell, and V. E. Hollinsworth. Presented by C. S. Beals, F.R.S.C.

The Dominion Observatory time transmitters which operate with the call sign CHU and frequencies 3330 kc/s, 7335 kc/s, and 14670 kc/s have been modified to provide precise carrier frequencies as well as seconds' beats from a standard oscillator. By direct wire, the oscillator is referred daily to the caesium resonator at the National Research Council and maintained within a part in 10^9. On January 1, 1961, the Dominion Observatory joined other national observatories in maintaining a synchronized world-wide time service.

11. Improvement in Canadian Observations of Time and Latitude. By L. D. G. Miller, V. E. Hollinsworth, and S. B. Sim. Presented by C. S. Beals, F.R.S.C.

The Ottawa photographic zenith telescope (PZT), the instrument used to determine time and latitude from stellar observations, has recently been moved from its temporary location within the transit room to an observing hut of modern design. The night error in right ascension and declination (dispersion of nightly values from the adopted smooth curve) fell from 13 milliseconds to 7 milliseconds and from 0″.08 to 0″.05 respectively, figures which are in excellent agreement with those at other observatories. A description of the observing hut together with a discussion of recent observations is given.

12. Satellite Observing at the Dominion Observatory, Ottawa. By R. W. Tanner and J. J. Labrecque. Presented by C. S. Beals, F.R.S.C.

The launching of the first Russian satellite on October 4, 1957, created widespread interest in the tracking and timing of passages in order to provide evidence for improved orbital elements. The first observations at the Dominion Observatory were visual. A private camera with an f/2.9 lens, hastily modified with a single blade shutter, provided trails with timed breaks accurate to 0.1 second. In 1958, a K-19 aerial camera with an f/2.5 12-inch lens was mounted on a permanent equatorial base on the roof. A rough scaling of the plate, usually all that is required, yields positions accurate to 0.1 second of time and 0.1 degree of arc. A precise examination improves the accuracy to 0.05 second of time and 0.01 degree of arc. Observations have been limited to Russian Sputniks and the Echo I balloon. Results have been forwarded to established data centres in the U.S.A., the U.S.S.R., and the U.K.

13. Progress Report on the Ottawa Mirror Transit. By G. A. Brealey. Presented by C. S. Beals, F.R.S.C.

The design of a mirror transit, originally proposed by Atkinson, has been under development at the Dominion Observatory, Ottawa, since 1953. When complete it will have provision for either visual or photographic registration of stellar transits, with complete automation of the latter if feasible. A limiting magnitude of about 11 has been demonstrated, and if the instrument fulfils the promise of preliminary tests the capabilities of the mirror transit will extend materially the range of meridian observing.

14. Cosmic-Ray Effects in Relation to Solar Flares and Magnetic Storms. By Hugh Carmichael, F.R.S.C.

Recent observations of cosmic-ray particles, accelerated in solar flares, and detected by neutron monitors, will be discussed in relation to a particular model of the solar gas clouds that are required to explain magnetic storms. It will be argued that these gas clouds, ejected from the vicinity of sunspots, must carry part of the sunspot magnetic field in the form of large, fairly regular, expanding magnetic loops of force which remain attached to the sun near the sunspot. This magnetic system can act as a guide and a storage bottle for solar cosmic rays and it can also diminish the intensity of galactic cosmic radiation to produce a Forbush decrease.

SYMPOSIUM ON DIELECTRICS

Convener: D. W. DAVIDSON

Tuesday, 9.30 a.m.

1. Some Recent Work in Dielectrics. By John Hart. Presented by M. S. Macphail, F.R.S.C.

A discussion is given of dielectric theory in relation to macroscopic experiments and the approximations which are involved in the comparisons. Deviations from regular

behaviour are of great interest at frequencies below 1 kc/sec and at frequencies near 1 Gc/sec. Temperature as well as frequency is of importance and experiments on dielectrics at temperatures above 1000° C are critically examined.

2. Microwave Optics of Dielectric Rods and a 45°–90°–45° Prism. By A. B. McLay, F.R.S.C.

E. M. field intensities have been measured in the close vicinity of dielectric circular cylinders, a semi-circular cyclinder and a 45°–90°–45° prism. The length axes of the cylinders and the refracting edges of the prism were perpendicular to the propagation direction and parallel to the vibration direction of a polarized incident beam of nearly plane 3.2 cm waves.

Fields of the circular cylinders, long rods, 1 inch in diameter, of commercial lucite, tenite, and hard rubber compound, have been compared with those predicted by diffraction theory. The fields of a long semi-circular cylinder of 1½ inch diameter lucite and that of a full cylinder of the same diameter are compared. Pronounced effects in some patterns caused by total internal reflection at and evanescent waves behind totally reflecting surface regions are of particular interest. Dielectric measurements are also reported.

3. Dielectric Saturation Effects and Hydration of Polymeric and Simple Ions. By J. E. Desnoyers and B. E. Conway. Presented by K. J. Laidler, F.R.S.C.

The purpose of the work described in this paper has been to obtain information about the hydration of polyions by evaluating the degree of dielectric saturation near the charged particles and relating it to experimentally determined salting out constants for simple non-electrolytes and to solvent electrostriction as estimated from partial molal volume determinations. The dielectric constant has been obtained as a function of the distance from the polyion by numerical solution of the Poisson-Boltsmann equation using known relations between dielectric constant and field strength. The calculations have been applied to simple ions, cylindrical polyions, spherical polyions, and planar colloidal ions. The predicted degrees of primary hydration of polyelectrolytes at various charge densities lead to a quantitative interpretation of observed salting out constants and partial molal volumes.

4. The Dielectric Constant of Adsorbed Matter. By I. Chapman and R. McIntosh, F.R.S.C.

A brief general discussion is given of the problem of ascertaining adsorbate properties through the measurement of the dielectric constant. The problem is illustrated by reference to the systems ethylchloride-Vycor glass and butane-Vycor glass using results for these systems over a temperature range from −20° C to −180° C. Evidence of interaction between ethylchloride and the surface is reported, as well as the very small temperature coefficient of dielectric constant which appears characteristic for this substance in the adsorbed state.

5. Evidence for an Ionic Cascade Process in Thin Oxide Dielectrics. By L. Young. Presented by I. E. Puddington, F.R.S.C.

When electrodes of tantalum and similar metals are polarized anodically in aqueous solutions, the oxide layer grows uniformly owing to the passage of an ionic current. Electronic conduction is negligible. The electric field strength in the oxide required to obtain convenient current densities is in the range 10^6 to 10^7 Vcm^{-1}. It is believed that the current is carried by interstitial metal ions and that these are present essentially as Frenkel defects. When a high field is applied to a film with a low initial concentration of defects, the concentration of defects and hence the current builds up slowly at first and then more rapidly. It is suggested that the process responsible for the increase in the concentration of defects is the collision of mobile ions with lattice ions.

6. Dipole Moment Measurements from Microwave Spectroscopy. By David B. McLay. Presented by R. McIntosh, F.R.S.C.

The Stark effect in microwave spectroscopy allows the determination of molecular electric dipole moments of polar molecules in the vapour state if the rotational constants can be determined. Analytical expressions give the "Stark Splitting" in the cases of linear and symmetric top molecules while interpolations in intensity tables can be used to get approximate values in the case of asymmetric top molecules. Hyperfine structure due to the interaction of the nuclear electric quadrupole moment makes second-order perturbation calculations necessary in the "intermediate-field" region. Such calculations have been successful even for asymmetric top molecules containing one quadrupolar nucleus such as CHF_2Cl which has a dipole moment in the ground vibrational state of 1.5 Debyes along the *c*-axis of the inertial ellipsoid.

7. Stress-Induced Aging in Ferroelectric Ceramics. By R. F. Brown. Presented by G. O. Langstroth, F.R.S.C.

The dielectric constant of several ferroelectric ceramic compositions has been measured as a function of time after a two-dimensional stress is applied normal to the axis of poling. It was found that the dielectric constant decreased linearly with the logarithm of time, a phenomenon similar to the aging which takes place after the poling of a ferroelectric ceramic by a strong dc voltage. The rate of this stress-induced aging increases with stress initially but reaches a maximum which appears to be independent of the magnitude of the change in stress.

SYMPOSIUM ON PROPERTIES OF ALLOYS SHOWING "GIANT" THERMOELECTRIC ANOMALIES AT LOW TEMPERATURES

Convener: J. S. DUGDALE

Tuesday, 9.00 a.m.

1. Scattering of Electrons in Solids. By D. K. C. MacDonald, F.R.S.C.

Experimental evidence in the past and current theoretical work (R. W. Schmitt, Phys. Rev. **103**, 83 [1956]; A. D. Brailsford and A. W. Overhauser, J. Phys. Chem. Solids **15**,

140 [1960]; M. Bailyn, "Transport in Metals with Magnetic Impurities I," to be published; and A. R. de Vroomen, "A Note on the Interaction between Electrons and Magnetic Impurities in Metals," to be published) have shown that anomalously large thermoelectric powers, coupled with resistive anomalies, can arise at very low temperatures in metals where particular scattering mechanisms are present.

We shall try to review in outline some of the questions that arise in analysing scattering of conduction electrons in solids (more particularly metals and alloys).

2. The Specific Heat of Dilute Alloys. By Douglas L. Martin. Presented by D. K. C. MacDonald, F.R.S.C.

Dilute alloys of transition metals in noble metals which show the "resistance-minimum" phenomenon also show an anomalous specific heat apparently extending from the region of the absolute zero to the temperature of the minimum. There is some evidence that at very low temperatures the anomalous specific heat may vary linearly with temperature and be almost *independent* of the solute concentration. The results would be consistent with Schmitt's suggestion that the anomalous resistivity results from removal of the ground state spin degeneracy of the solute ions by a local field.

3. Magnetic Properties of Dilute Alloys. By F. T. Hedgcock. Presented by J. A. Morrison, F.R.S.C.

Studies of the magnetic properties of alloys exhibiting resistive anomalies have led to some understanding of the influence of internal magnetic fields and the spectroscopic state of the paramagnetic ion on the anomalous resistive behaviour. The particular systems that have received most attention have been Cu-Mn (J. Owen, M. E. Browne, V. Arp, and A. F. Kip, J. Phys. Chem. Solids **2**, 85 [1957], Cu-Co (I. S. Jacobs and R. W. Schmitt, Phys. Rev. **113**, 454 [1954]), and Cu-Fe (F. T. Hedgcock, Phys. Rev. **104**, 1564 [1956]). Recently measurements of the magnetic susceptibility, electron spin resonance, and resistivity of Mg-Mn, Al-Mn, and Zn-Mn alloys have been completed at the University of Ottawa. The de Haas-van Alphen effect has also been measured in a dilute Zn-Mn alloy.

A compilation of available data on the various systems will be made and discussed from the point of view of:

(i) the spectroscopic state of the paramagnetic ion;
(ii) the nature of the paramagnetic ion interactions in the region of the resistive anomalies; and
(iii) the nature of the internal magnetic fields in the region of the resistive anomalies.

4. Theory of the Resistivity Minima and Giant Thermoelectric Powers at Low Temperatures in Metals with Magnetic Impurities. By M. H. Bailyn. Presented by R. McIntosh, F.R.S.C.

The large thermoelectric powers and resistivity minima found in metals containing magnetic impurities may be explained roughly by the Yosida model when the distribution function is expanded in a series in powers of $E-\zeta$; ζ is the Fermi energy. The Kohler Variational Principle adapted to take spin flips into account yields expressions that are of the right order of magnitude and curves that are of the right shape. A physical interpretation of the thermoelectric power is made in this talk.

Additional Papers Concerning the Solid State Which Are Not Part of the Symposium

5. Investigation of Semiconductors with Layer Structure. By Gaston Fischer, E. Mooser, and J. L. Brebner. Presented by D. K. C. MacDonald, F.R.S.C.

During an investigation of certain semiconductors with typical layer structure, for example, GaTe and GaSe, it has been observed that the electrical conduction within the layers, and perpendicular to the layers, proceeds according to completely different mechanisms. The chemical bonds between the layers are of the van der Waals type, and thus very weak. Consequently each layer behaves almost like an ideal two-dimensional conductor that can be described with a two-dimensional Brillouin zone. Between the layers there is a very high potential barrier so that conduction takes place by tunnelling processes. Investigations of this tunnelling mechanism by photoconductivity, together with experiments on optical absorption and galvanomagnetic properties, should give interesting information on the energy band structure of these two-dimensional Brillouin zones.

6. The Low Temperature Resistive Anomalies in Mg-Mn. By E. Wallingford and F. T. Hedgcock. Presented by D. K. C. MacDonald, F.R.S.C.

The recently discovered resistive maximum in dilute alloys of the magnesium-manganese system led to an investigation of the anomalous low temperature resistive properties of this alloy. An experimental comparison between the anomalous Mg-Mn system and the normal Al-Mn system between 2 and 273° K was fruitful in suggesting an experimental separation of the anomalous resistivity component. It is found that the true percentage depth of the resistive minimum in the Mg-Mn system is constant in magnitude for all concentrations of manganese studied. The temperature at which the resistivity starts to decrease with decreasing temperature (that is, the maximum) is unaffected by this analysis.

MATHEMATICS—MATHEMATIQUES

Tuesday, 9.30 a.m.

1. Unitary Dilations of Contractions. By Israel Halperin, F.R.S.C.

Sz.-Nagy showed that if T is a contraction on a Hilbert space H then for some K containing H there exists a unitary operator $U = U(T)$ on K such that $T^n = P_H U^n$ for all $n \geqslant 1$ (P_H, acting on K is the projection onto H). Schreiber showed that U is a bilateral shift operator whenever $|||\, T \,||| < 1$; De Bruijn showed that it is sufficient if $||\, T^n x \,|| \to 0$ as $n \to \infty$ for each x in H. By using a geometric method we now prove the more general theorem: Suppose T is a contraction on $H = L \oplus M \oplus R$ with $TL \subset L \oplus M$ and $T(M \oplus R) \subset R$. If, as $n \to \infty$, $||P_L T^n x|| \to 0$ and $||P_R (T^*)^n x|| \to 0$ for all x, then $U(T)$ is a bilateral shift operator.

2. On the Osculating Hyperplanes of Curves in Projective n-space. By Peter Scherk, F.R.S.C.

Suppose the curve $X(u)$ in projective n-space is $(n-1)$-times [continuously] differentiable at $u = u_0$ and the points $X(u_0), \dot{X}(u_0), \ldots, x^{(n-1)}(u_0)$ are linearly independent. Suppose

$u_0, u_1, \ldots, u_{n-1}$ $[u_1, u_2, \ldots u_n]$ are mutually distinct. Then the points $X(u_0), X(u_1), \ldots, X(u_{n-1})$ $[X(u_1), \ldots, X(u_n)]$ are linearly independent if all the u_i are sufficiently close to u_0. The hyperplane through these points converges to the hyperplane

$$(Y, X(u_0), \dot{X}(u_0), \ldots, X^{n-1}(u_0)) = 0$$

if the u_i tend to u_0. Closely analogous results hold for the osculating hyperspheres of curves in euclidean or conformal spaces.

3. An Algorithm for the Term Rank of a Matrix and for the Canonical Decomposition of an $n \times m$ Bipartite Graph. By A. L. Dulmage and N. S. Mendelsohn, F.R.S.C.

(I) In connection with the marriage problem Marshall Hall has given an algorithm for finding the marriage transversal when such a transversal exists. In this paper the authors extend the algorithm so that it is possible to construct the maximum transversal of any $m \times n$ bipartite graph (and hence to find the term rank of a matrix of 0's and 1's).

(II) Beginning with the maximum transversal of an $n \times m$ bipartite graph provided by the algorithm in (I), the authors give an algorithm which effects the complete canonical decomposition of a graph.

(III) In a previous paper the authors have given a rapid procedure for determining if an $n \times n$ graph is irreducible provided a transversal of length n is known. The solution of (I) provides the required transversal.

4. On the Idempotents of a Φ-Algebra. By B. Brainerd. Presented by G. de B. Robinson, F.R.S.C.

In a paper to appear in Fund. Math., M. Henriksen and D. G. Johnson define a Φ-algebra to be an archimedean lattice-ordered algebra over the real field which has a unit element 1 that is a weak order unit.

The ring $C(X)$ of continuous functions on a completely regular hausdorff space X is a Φ-algebra. Four conditions on the idempotents of a Φ-algebra are given which characterize $C(X)$ in certain cases.

In addition, one of these conditions is, together with uniform closure, necessary and sufficient for a general Φ-algebra to be conditionally σ-complete with respect to its order relation.

Finally, a characterization is given of the Φ-algebras which are isomorphic to $C(X)$ for an X with the property that βX is zero-dimensional.

5. A Rank Number for a Class of Polygons. By Douglas Derry, F.R.S.C.

In 1928 C. Juel showed that no more than four tangents of a differentiable curve of order 3 in real projective 3-space intersect a given straight line. The present paper shows that if curves of order n in n-space are replaced by a related class of polygons then, with certain intersection conventions, the n-dimensional generalization of Juel's result that no more than $2n-2$ tangents of such a polygon can intersect any n-2-dimensional linear subspace, is true.

6. On the Laguerre Coefficient Problem. By P. G. Rooney. Presented by G. F. D. Duff, F.R.S.C.

For each $\alpha > -1$ we denote $L\alpha$ the collection of functions ϕ which are defined on $[0, \infty)$, of bounded variation on $[0, R]$ for each $R > 0$, and such that for any $\sigma > 0$.

$$\int_0^\infty e^{-\sigma t} t^{\frac{1}{2}\alpha} dV_\phi(t) < \infty,$$

where $V\phi(t)$ is the total variation of ϕ on $[0, t)$. Let $K_\alpha \subset L_\alpha$. By the Laguerre coefficient problem for K_α is meant the determination of necessary and sufficient conditions that a given sequence $\{q_n\}$ be represented as the Fourier-Laguerre coefficients of a function in $K\alpha$.

It is shown that the Laguerre coefficient problem for $K\alpha$ can be solved if and only if the representation problem for Laplace transforms of functions in $K\alpha$ can be solved. A similar programme is carried out for Hermite coefficients, these being related to Gauss transforms.

7. Matrix Orthogonal Polynomials. By F. V. Atkinson. Presented by G. de B. Robinson, F.R.S.C.

For the theory of ordinary orthogonal polynomials, possible starting points are recurrence formulae, extremal properties, and the orthogonal property, it being known that these starting-points are equivalent. In this paper the corresponding propositions will be discussed for the case that the polynomials have matrix coefficients. We start from the recurrence formula, and proceed to the existence of a distribution with respect to which the polynomials are orthogonal.

SYMPOSIUM ON INORGANIC CHEMISTRY

Convener: M. L. LISTER

Tuesday, 9.30 a.m.

1. Acetylenic Complexes of Platinum. By A. D. Allen and T. Theophanides. Presented by F. E. Beamish, F.R.S.C.

An equilibrium and kinetic study has been made of complexes of the general form $[(R_2C(OH)C \equiv C.C(OH)R_2)Pt^{II}X_3]^-$ where R = alkyl and X = halogen. Displacement of one of the halogens (in the *trans* position to the acetylene ligand) occurs readily, and at equilibrium in aqueous solutions of the complex salt this halogen is replaced almost completely by a water molecule. The acid dissociation constant of the resulting aquo complex has been measured.

Reactions of these complexes in various solvents are discussed in terms of the *trans* effect of the acetylene and the interaction between the hydroxyl groups of the acetylene and the metal atom.

2. Reactions of Covalent Fluorides with Sulphur Trioxide. By R. J. Gillespie and E. A. Robinson. Presented by H. G. Thode, F.R.S.C.

The reactions between sulphur trioxide and a number of fluorides such as BF_3, AsF_3, and SbF_5 have been investigated. The main products of the $BF_3 - SO_3$ reaction are the polysulphuryl fluorides $S_nO_{3n-1}F_2$. In addition to $S_2O_5F_2$ and $S_3O_8F_2$ which have been prepared previously $S_4O_{11}F_2$ was isolated in a pure state from the products of the reaction and characterized by means of its Raman and n.m.r. spectra. Strong evidence was also obtained from n.m.r. spectra for the formation of all the higher polysulphuryl fluorides up to $S_7O_{20}F_2$. The products of the reactions between SO_3 and other fluorides will also be discussed.

3. Oxidation of Carbon Monoxide by some Metal Ions and Complexes. By J. Halpern, A. C. Harkness, and S. Nakamura. Presented by R. McIntosh, F.R.S.C.

Although the majority of common oxidizing agents are relatively unreactive towards CO in aqueous solution, a few, notably Hg^{2+}, MnO_4^- and some complexes of Ag^+, were found to undergo reduction readily. In perchloric acid solutions the reduction of Hg^{2+} (to Hg_2^{2+}) proceeds according to the rate-law, $k[CO][Hg^{2+}]$ with $\triangle H^* = 14.6$ Kcal/mole and $\triangle S^* = -13$ e.u. The following mechanism is proposed: $Hg^{2+} + OH_2 + CO \rightarrow [Hg.CO.OH]^+ + H^+$ (slow); $[Hg.CO.OH]^+ \rightarrow Hg + CO_2 + H^+$ (fast); $Hg + Hg^{2+} \rightarrow Hg_2^{2+}$ (fast). Ag^+ is unreactive towards CO in acidic solution but its amine complexes are reduced readily in basic solution according to the rate-law, $k[CO][Ag.L^+][OH^-]$ (where L = amine). The latter is consistent with a rate-determining step, $L.Ag^+ + CO + OH^- \rightarrow [L.Ag.CO.OH]$, involving the formation of an intermediate analogous to that formed by Hg^{2+}. The uncatalysed reduction of MnO_4^- proceeds over a wide pH range, according to the rate-law $k[CO][MnO_4^-]$ with $\triangle H^* = 13$ Kcal/mole and $\triangle S^* = -17$ e.u. In addition, very efficient catalytic paths, involving Ag^+ and Hg^{2+} as catalysts, were found for this reaction; the kinetics and mechanisms of these are discussed.

4. The Magnetic Properties of Transition Metal Arsenides. By C. M. Pleass and R. D. Heyding. Presented by I. E. Puddington, F.R.S.C.

Although the iron and nickel analogues of $CoAs_3$ (skutterudite) do not exist, considerable quantities of cobalt in $CoAs_3$ can be replaced by either iron or nickel or both. The effects of these substitutions on the magnetic and electrical properties of $CoAs_3$ are reported and discussed with reference to the bonding model proposed recently by Dudkin *et al.* The application of this model to the diarsenides of the transition metals is reviewed in terms of available susceptibility data.

5. Some Oxidation Reactions of Manganese. By M. L. Lister and Y. Yoshino. Presented by F. E. W. Wetmore, F.R.S.C.

The kinetics of the oxidation of manganate ions by periodate or hypochlorite ions have been measured, and it is shown that both reactions proceed through an initial disproportionation to permanganate and hypomanganate ions: $2\ MnO_4^{-2} \rightarrow MnO_4^- + MnO_4^{-3}$. This reaction is reversible; and the present results combined with known thermodynamic data enable the rate constants and activation energies of the reaction in both directions to be evaluated. These results are compared with the known rate of interchange of manganate and permanganate ions, and calculations attempting to relate the various rate constants are reported.

6. The Preparation and Properties of Germyl Pseudo-Halides and Related Compounds. By J. E. Griffiths, T. N. Srivastava, and M. Onyszchuk. Presented by C. A. Winkler, F.R.S.C.

Germyl (iso)cyanate, GeH_3NCO, (iso)thiocyanate, GeH_3NCS, and acetate, GeH_3OCOCH_3, have been prepared in almost quantitative yield by the interaction of germyl bromide with silver cyanate, thiocyanate, and acetate, respectively. Some of the physical properties of these new compounds are reported, and their thermal decompositions at moderate temperatures are described. The reaction of germyl bromide with silver oxide or carbonate produces germanous hydride, $(GeH_2)_x$, and water, instead of digermoxane, $(GeH_3)_2O$. Germyl bromide reacts with sodium methylate forming methoxygermane, GeH_3OCH_3, in very low yield.

These results are compared with those expected on the basis of the silver salt conversion series previously proposed for silyl and trimethylgermyl derivatives. It is suggested that in their tetracovalent compounds germanium has a lesser tendency than silicon to use its vacant d-orbitals in supplementary bonding.

7. Magnetic Super-exchange in Transition Metal Halides. By A. D. Westland and S. S. I. Kaseno. Presented by K. J. Laidler, F.R.S.C.

A review of the importance of magnetic super-exchange phenomena in various experimental approaches to the study of bonding is presented. It is shown that not only magnetic susceptibility measurements but also electron spin resonance and optical absorption spectra may be complicated by the effects of super-exchange.

It is suggested that a consideration of the magnetic structures in terms of crystal field theory can afford an estimate of the magnitude of super-exchange coupling. The binary and ternary fluorides of nickel are examined in detail by the method of isomorphous dilution. The anisotropic structure of K_2NiF_4 and the orbital contribution from excited states combine to provide a particularly complicated behaviour.

SYMPOSIUM ON NUCLEAR MAGNETIC RESONANCE AND ELECTRON SPIN RESONANCE

Convener: G. M. VOLKOFF, F.R.S.C.

Wednesday, 9.30 a.m.

Invited Papers

1. Nuclear Magnetic Resonance and the Electron Density Distribution in Molecular Systems. By W. G. Schneider, F.R.S.C.
2. Contribution of Nuclear Magnetic Resonance to the Systematic Classification and Crystal Chemistry of the Hydrated Borate Minerals. By H. E. Petch.
3. Electron Spin Resonance Spectra of Radicals in Single Crystals of Organic Compounds. By C. A. McDowell.

Section III, Wed. a.m., NMR and ESR

Contributed Papers

4. Medium Effects in Proton Magnetic Resonance Spectra. By W. T. Raynes and H. J. Bernstein, F.R.S.C.

The position of the proton resonance signal of a molecule depends on its environment. Four distinct contributions are discussed to explain the shift of the signal for gases, liquids, and solutions; (*a*) bulk susceptibility, (*b*) van der Waals interactions, (*c*) polarity, and (*d*) neighbour-molecule anistropy. Values for each contribution have been derived theoretically. For gases, good agreement between theory and observation is obtained, while for the condensed phase good agreement is achieved only in the case of non-polar liquids or solvents.

5. Hindered Internal Motion in a Substituted Ethane. By S. Brownstein. Presented by I. E. Puddington, F.R.S.C.

For a substituted ethane of formula CH_2X-CXYZ the two hydrogen atoms are magnetically non-equivalent regardless of the rate of rotation about the carbon-carbon bond. With a formula CHXY-CHXY two stereoisomers and five conformations are possible. The compound 2,5-dimethyl-2,5-dimethoxy-3,4-diphenylhexane contains both these features. Energy differences and rotation rates, as determined by proton resonance spectroscopy, will be presented. The assignment of absorption peaks to particular conformations will also be described.

6. The Nuclear Magnetic Resonance Spectra of Compounds Containing Methyl Groups Attached to Saturated Carbon Atoms. By F. A. L. Anet. Presented by K. J. Laidler, F.R.S.C.

Methyl groups attached to saturated carbon atoms give rise to bands in the NMR spectra which can be classified into three categories, depending on whether the carbon atom bearing the methyl group has attached to it two, one, or zero hydrogen atoms. However, methyl groups belonging to any one of the above categories can give rise to appreciably different types of bands and the factors influencing these differences will be discussed.

7. Proton Magnetic Resonance Study of Quinoline Derivatives in Solution. By L. W. Reeves and K. O. Strømme. Presented by G. M. Volkoff, F.R.S.C. (By title.)

Proton resonance studies of several quinoline derivatives in acetone, benzene, and carbon tetrachloride solutions have been made. The protons on the heteroaromatic ring form a group which give spectra approximating to an ABC, ABX, or AMX case. The type of spectrum observed depends on the compound, solvent, and concentration. In most cases, approximations to the complete analysis of the spectra for the hetero ring can be made in spite of some overlap with the proton resonance in the second aromatic ring. Solvent effects have been studied by varying the concentration of the quinoline derivative.

8. Proton Spin-Lattice Relaxation in Methane and its Deuterated Modifications. By H. S. Sandhu and M. Bloom. Presented by G. M. Volkoff, F.R.S.C. (By title.)

The spin-lattice relaxation time, T_1, has been measured in purified samples (Sandhu *et al.*, Can. J. Chem. **38**, 493 [1960]) of CH_4, CH_3D, CH_2D_2, and CHD_3 from 110° K to 80° K using pulse techniques. From 110° K to 90° K, T_1 in seconds varies from 16 to 10 in CH_4, 17 to 11 in CH_3D, 25 to 17 in CH_2D_2, and 45 to 27 in CHD_3. In each case, there is a discontinuity in T_1 at the melting point (90° K). The temperature dependence of T_1 in the solids gives activation energies for self diffusion of 3200 cal/mole for each sample.

9. On the Nuclear Spin Relaxation in Hydrogen Gas. By G. T. Needler and W. Opechowski, F.R.S.C.

The Schwinger formula for the relaxation time T_1 of nuclear spins in hydrogen gas is valid only for sufficiently low temperatures. An approximate theory of T_1 is developed valid for any temperature. An explicit expression is given for T_1 valid for temperatures up to room temperature; this expression reduces to the Schwinger formula for sufficiently low temperatures.

10. Proton Magnetic Resonance Study of Phase Transitions in Rubidium and Caesium Stearates. By D. J. Shaw and B. A. Dunell. Presented by G. M. Volkoff, F.R.S.C.

Proton magnetic resonance spectra of rubidium and caesium stearates have been obtained between 77° and 430° K. Very rapid decreases in line width and second moment of both salts at about 340° K have been interpreted as being due to a change in crystal structure accompanied by increased motion of the hydrocarbon chain. A second abrupt decrease in line width to the limit of modulation broadening and in second moment to 1 or 2 gauss^2 occurs at 416° K for rubidium stearate and 373° K for caesium stearate. The hydrocarbon chains move more freely in the caesium than in the rubidium lattice.

11. Proton Magnetic Resonance Absorption in some Long-Chain Fatty Acids. By R. F. Grant. Presented by G. M. Volkoff, F.R.S.C. (By title.)

Proton magnetic resonance absorption in palmitic, myristic, lauri . and capric acids was measured between 90° K and the melting points. The results suggest that the lattice is rigid at 90° K, but that the methyl end group is free to rotate at about 300° K. A distinct change in the line shape was observed at approximately 100° below the freezing point in each acid. The meaning of this is not clear. Pre-melting, which is characterized by the appearance of a narrow line, becomes more prominent with increasing chain length.

12. Proton Resonance in Paramagnetic and Antiferromagnetic $CoCl_2.6H_2O$. By E. Sawatzky and M. Bloom. Presented by G. M. Volkoff, F.R.S.C. (By title.)

The proton magnetic resonance absorption line in single crystals of $CoCl_2 \cdot 6H_2O$ was studied as a function of external magnetic field and temperatures down to 1.52° K. At room temperature the spectrum at 12 Mc/sec consists of a single line six gauss wide. A splitting into a maximum of six components has been observed at 4.2° K. The over-all

separation (110 gauss at 4.2° K) yields a Curie temperature of 3.8° K. The transition temperature to the antiferromagnetic state (2.28° K) was measured by observing the change in the spectrum. The proton resonance lines associated with the paramagnetic phase gradually disappear between 2.30° K and 2.22° K.

13. Generalized Bloch Equations. By G. M. Volkoff, F.R.S.C. and S. D. Jog.

Generalized Bloch equations of the form $d\mathbf{r}/dt = \mathbf{r}\times\boldsymbol{\Omega}$ are shown to hold in the absence of relaxation for systems of nuclei of arbitrary spin subjected to given quite general combinations of electric and magnetic fields. Expressions are obtained for $\boldsymbol{\Omega}$ in terms of the Hamiltonian, and for $\mathbf{r}$ in terms of suitable linear combinations of macroscopic magnetization, quadrupole moment density, etc., characterizing the system. These results are compared with special cases discussed previously by Bloom *et al.* (Phys. Rev. **97**, 1699 [1955]; Can. J. Phys. **36**, 1286 [1958]) and by Lurçat (J. phys. et radium **19**, 713 [1958]).

14. Dynamic Nuclear Polarization in Ruby. By A. Szabo. Presented by D. W. R. McKinley, F.R.S.C.

Experiments on the dynamic nuclear polarization arising from the saturation of Cr^{3+} esr resonances in Al_2O_3 will be described. The power required to saturate the esr lines has two components: one, the usual power absorption for the Cr^{3+} esr, while the other goes into maintaining dynamic polarization of the Al^{27} and Cr^{53} nuclei. The process by which this extra power absorption occurs will be discussed, as well as the decrease of microwave power absorption which is observed when the dynamic polarization is destroyed by application of a saturating field at the nuclear resonant frequencies.

15. Ruby Line Shape Under Saturation Conditions. By R. A. Armstrong. Presented by D. W. R. McKinley, F.R.S.C.

The line shape of 0.05 per cent Cr_2O_3 doped sapphire depends on the power level. The absorption saturates more readily than the dispersion. In addition, when cross-relaxation is present, the dispersion shape function is altered significantly.

16. Transformation Properties of Crystalline Electric Field Angular Momentum Operators. By H. A. Buckmaster. Presented by H. Grayson Smith, F.R.S.C.

The transformation of the angular momentum eigenfunctions $Y_{lm}(\theta,\phi)$ from one coordinate system to another according to

$$D(\alpha\beta\gamma)\,Y_{lm}(\theta,\,\phi) = Y_{lm}(\theta',\,\phi') = \sum_{m'=-1}^{1} Y_{lm'}(\theta,\,\phi)\,(lm'|D(\alpha\beta\gamma)|lm)$$

is possible because the rotation group can be parameterized in terms of the Eulerian angles $D(\alpha\beta\gamma)$. It is shown that an analogous expression derives for the transformation of the crystalline electric field angular momentum operators $O_l^m(J,J_z)$ which have the same transformation properties as the corresponding spherical harmonics. This makes it possible

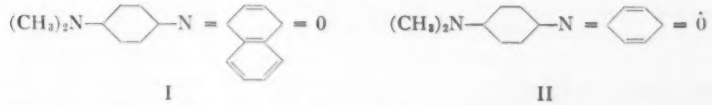
to transform any spin-Hamiltonian into a co-ordinate system of arbitrary orientation and to express the resulting expression in a closed form in terms of these operators and spherical harmonics.

17. The Temperature Dependence of the Shape of Paramagnetic Resonance Lines. By Malcolm McMillan and W. Opechowski, F.R.S.C. (By title.)

At sufficiently low temperatures the temperature dependence of the shape of paramagnetic resonance lines of crystals is due mainly to the temperature dependence of the occupation numbers of the energy levels of the system of interacting paramagnetic ions. The theory of this effect, recently developed by the authors (Can. J. Phys. **38**, 1168 [1960]), is extended to the case of anisotropic exchange interaction and arbitrary ellipsoidal shape of the paramagnetic crystal.

18. Indophenol Compounds, An Unusual Electron Resonance. By A. H. Reddoch. Presented by W. G. Schneider, F.R.S.C.

The compounds indophenol blue (I) and phenol blue (II)



I II

have been examined in a paramagnetic resonance spectrometer operating at 3 cm.

Phenol blue (II) shows a fairly weak resonance with a width of about 10 gauss and a *g*-value of about 2.0.

Indophenol blue (I) gives a resonance of surprisingly great intensity and a large peak-to-peak width of about 1000 gauss. Several organic solutions of this compound gave no resonances.

Apparently intermolecular interactions in the indophenol blue (I) crystal cause unpairing of the electron spins and produce the wide resonance. The interpretation will be discussed.

19. Protonation of Weak Bases in Strongly Acid Media. By R. J. Gillespie and T. Birchall. Presented by H. G. Thode, F.R.S.C.

The protonation of a number of weak bases including *o*- and *p*-nitroaniline, 2:4-dinitroaniline, acetophenone, and benzophenone has been studied by the protomagnetic resonance spectra of their solutions in sulphuric acid and mixtures of sulphuric acid with water, nitromethane, and trifluoracetic acid.

20. Nuclear Magnetic Resonance in the Intermetallic Compound LiPb. By D. G. Hughes. Presented by D. K. C. MacDonald, F.R.S.C.

The Li^7 nuclear magnetic resonance signal in LiPb has been investigated in the range 25° C to a temperature above that of a second-order phase transition which occurs near 200° C.

Observable first-order quadrupole broadening in polycrystalline samples below the transition point shows conclusively that the structure of LiPb is not of the CsCl type as had previously been suggested. A strong temperature dependence of this quadrupole broadening is associated with the second-order phase transition.

21. Utilization of ESR in Evaluation of Interactions between Weakly Coupled Systems. By F. C. Adam. Presented by G. M. Volkoff, F.R.S.C.

By analysis of the nuclear hyperfine structure of the electron spin resonance of similar aromatic free radicals it is possible to determine changes in the electron distribution in the molecule. It is also possible to distort the molecule framework by making substitutions which result in steric strain and which, in effect, separate the system into two parts between which the electrons may be only weakly coupled. This may be shown from a comparison of the spectra of triphenyl methyl and of 9-phenyl xanthyl, wherein the h.f. splittings of the appended phenyl ring are considerably different from the xanthyl ring.

SYMPOSIUM ON PRECIPITATION IN THE ATMOSPHERE

JOINT SYMPOSIUM OF ROYAL METEOROLOGICAL SOCIETY (CANADIAN BRANCH) AND SECTION III

Convener: J. S. MARSHALL, F.R.S.C.

Wednesday, 9.30 a.m.

1. The Development of Hail from Rain. By R. H. Douglas, Walter Hitschfeld, and E. J. Stansbury. Presented by J. S. Marshall, F.R.S.C.

Recent observations suggest that hailstones grow without disintegration even if containing large fractions of liquid water. This allows us to compute the fast growth of large hail in the dense rain caught in an updraft. To understand the hailstorm requires that this growth information be combined with the known freezing probabilities of cloud and rain drops. This probability increases with height, and the resulting stones increasingly compete for the available water. The simultaneous consideration of many factors—notably of temperature, cloud and rain density, stone consistency, and updraft—allow the specification of the relatively narrow ranges in the variables for which sustained hail development is possible.

2. A Synoptic Study of the Occurrence of Hail in Central Alberta, 1959. By R. W. Longley and C. E. Thompson. Presented by N. H. Grace, F.R.S.C.

Seven meteorological variables were identified which showed some correlation with Alberta hail: (1) an outbreak of colder air; (2) a northwesterly flow at low levels; (3) cyclonic vorticity at 500 mb; (4) cyclonic vorticity at 500 mb over British Columbia during the preceding night; (5) a steep vertical temperature gradient to 300 mb; (6) a steep horizontal temperature gradient at 850 mb between Edmonton and Great Falls, Montana; and (7) unstable air over Great Falls.

None of these, by itself, could be used to identify a day with hail, but if three or more of these variables were present with sufficient intensity, the probability of considerable hail somewhere in Alberta was over 50 per cent. If less than three were present, hail was improbable.

3. Radar Scatter by Large Hail. By D. Atlas, W. G. Harper, F. H. Ludlam, and W. C. Macklin. Presented by J. S. Marshall, F.R.S.C.

Results of experiments to measure the back-scatter from individual hailstones are reported. A dry ice sphere scatters much better than an equal particle of water "or metal" when its diameter exceeds the wave length. As melting starts the scatter decreases towards and occasionally falls below the all-water value. The results are confirmed by the theoretical computations of Herman and Battan. The behaviour of the ice as a scatterer is also explained semi-quantitatively using geometric optics by which it is found that the particle acts as a dielectric lens. The implications of the results with regard to radar observation of hailstorms are noted.

4. Precipitation Physics Project in Northwestern Quebec: Its Design and Operation. By J. D. Holland and C. L. Crozier. Presented by A. Thomson, F.R.S.C.

A precipitation physics project aimed at discovering basic relations in the chain of cause and effect in precipitation mechanisms has been operated in northwestern Quebec since 1959. In addition to conventional observational techniques, this project employs randomized cloud seeding of synoptic-scale weather systems as one method of studying these mechanisms. The seeding is done by aircraft, and the randomization is applied in a "cross-over" pattern designed to hasten the attainment of significant statistical results. This paper discusses the experimental design and the operational techniques being employed in the project. With at least three more years for the project to run, significant statistical results are not yet available.

5. Areal Integration of Precipitation Observed by Radar. By P. M. Hamilton and K. L. S. Gunn. Presented by J. S. Marshall, F.R.S.C.

We have set up a scale of precipitation intensity consisting of seven thresholds, proceeding by factors of four in rainfall rate from 0.1 mm hr^{-1} to 400 mm hr^{-1}. The radar has an area of 60,000 mi^2 under surveillance. At each of six heights, we derive the fraction of that area covered by precipitation of greater than threshold value for each of the seven thresholds. The results are most usefully viewed as profiles of areal coverage as a function of height. These data, in turn, are readily converted to the average flux of precipitation yielded by each threshold, averaging over the total area. Of the weather radar information relevant to the continent-wide picture, this family of profiles is probably the most helpful. While the information is at present derived rather laboriously from CAPPI maps in stepped grey scale, it should be possible to derive and process it automatically and with negligible time delay.

CHEMISTRY AND PHYSICS

Conveners: C. A. WINKLER, F.R.C.S., AND G. A. WOONTON, F.R.S.C.

Wednesday, 9.30 a.m.

CHEMISTRY

1. A Source of Hydrogen Atoms for Kinetic Studies. By R. J. Cvetanović. Presented by C. A. Winkler, F.R.S.C.

Generation of hydrogen atoms in the primary step of the mercury photosensitized reaction of *n*-butane can, in principle, be used as a convenient technique for kinetic studies and for determination of the reaction rates of hydrogen atoms. In particular a competition for hydrogen atoms between *n*-butane and an added scavenger such as an olefine, can be readily followed. However, because at room temperature olefines react much more rapidly, quantitative interpretation of the observed effects depends on an understanding of the role of the olefine formed in the course of the reaction by disproportionation of free radicals and of the olefine initially present in small amounts in the *n*-butane as an impurity. On the basis of an experimental study of these processes expressions have been obtained which permit evaluation of these secondary effects. It is shown that using highly purified *n*-butane and conversions smaller than 10^{-2} per cent the initial conditions are closely approached and the combined effect of the two factors is then not too large. It is, however, by no means negligible, although it is possible to allow for it approximately. At the same time, inasmuch as it is desired only to compare the relative reactivities of a number of olefines (or other scavengers) towards hydrogen atoms, experimental conditions can be adjusted so that the measured relative rate constants are not subjected to any significant systematic errors.

2. Crystals of Cellulose and Cellulose Triacetate. By R. St. J. Manley. Presented by S. G. Mason, F.R.S.C.

This paper deals with the preparation and morphology of "perfect" single micro-crystals of cellulose and cellulose triacetate. The crystals are precipitated when dilute solutions are cooled under controlled conditions to temperatures below the temperature of dissolution. They are square in shape and consist of uniformly thin layers in which the chain molecules are arranged perpendicularly. Because the length of the molecules greatly exceeds the layer thickness, it is postulated that the molecules must be sharply folded in order to produce this orientation. The possible causes and consequences of this folding are discussed.

3. Infrared Studies on Amine Hydrohalides. By C. Sandorfy. Presented by C. A. Winkler, F.R.S.C.

Amine hydrohalides in the solid phase form hydrogen bonds of the $\overset{+}{N}—H - - X^-$ type. (X = F, Cl, Br, or I.) The nature of the hydrogen bond can be studied to advantage in these substances because conditions may be changed gradually through replacing one halogen by another. The spectra of the hydrohalides of many primary, secondary, and tertiary amines—both aliphatic and aromatic—were determined from 4000 to 250 cm^{-1} using a series of prisms. Salts of aromatic amines usually form stronger hydrogen bonds than aliphatic ones, and tertiary amine salts form stronger hydrogen bonds than secondary and primary ones. Furthermore, the strength of the hydrogen bond decreases in the order $Cl^- > Br^- > I^-$. This is shown by a shift towards higher frequencies of the $\overset{+}{N}H_n$ (n = 3, 2, or 1) stretching vibrations in this order and by a shift in the opposite direction of the $\overset{+}{N}H_n$ bending vibrations.

An important part of the width of the $\overset{+}{N}H_n$ stretching bands is caused by overlapping combination tones of deformation vibrations. The electrical anharmonicity accounts for an important part of the intensity of these combination bands. Fermi resonance is often encountered in these spectra, and we find a few cases where the $\overset{+}{N}H_n$ stretching bands are split because of a double minimum in the potential surface.

In order to obtain the vibrations of the "free," unassociated $\overset{+}{N}H_n$ groups, salts were prepared containing bulky anions where steric conditions prevent the formation of hydrogen bonds.

Methylamine hydrohalides were studied in detail at temperatures varying from 21° C to −190° C. Most of these undergo phase changes whose spectral manifestations are discussed.

4. Mechanism of the Irradiation Decomposition of H_2O_2 at Low Temperatures. By Jerzy Kroh, Basil C. Green, and John W. T. Spinks, F.R.S.C.

EPR studies of H_2O_2 solutions irradiated by $T\beta$-particles and UV light at liquid nitrogen temperature support the hypothesis that OH and HO_2 radicals are formed. A suggested reaction mechanism is:

$$OH + H_2O_2 = H_2O + HO_2.$$

Physics

1. Measurement of Magnetic Susceptibility in High Pulsed Magnetic Fields. By Richard Stevenson. Presented by G. A. Woonton, F.R.S.C.

The historical and technical background of producing magnetic fields greater than 200,000 oer and of making physical measurements in them is reviewed. Recent techniques of measuring magnetic susceptibility in the high fields are described, and results for a number of metals and compounds of the 3*d* transition group are presented. These experimental data are examined in terms of their possible theoretical significance, and of their relation to other areas of research in magnetism.

2. Field Separation of Optically Excited Carriers in a Silicon *p-n* Junction. By R. L. Williams. Presented by G. A. Woonton, F.R.S.C.

The separation of electron and holes in conventional photodiodes is realized subsequent to their diffusion to the depletion or field region. If the resistivity of the semiconductor (in this case, silicon) is chosen sufficiently high, and the diffused surface layer sufficiently thin (0.2 to 2.0 microns), the processes by which the optically excited carriers are separated are controlled primarily by the field of the depletion layer, and only secondarily by diffusion effects. Consequently, the separation process as well as being almost independent of carrier lifetimes in the material, has a response time in the range 10 to 100 nano-seconds.

The signal level corresponds to that obtained for unit quantum efficiency and the sensitivity is extremely high. Along with a description of signal levels, quantum efficiency, and noise will be given a discussion of the structural details determining spectral response.

3. Attenuation of Cosmic Radiation in Lead. By V. M. Forbes and A. I. McPherson. Presented by G. A. Woonton, F.R.S.C.

In a series of experiments on the absorption of cosmic radiation in lead, unexpected values of absorption for a 15 centimetre thickness of lead have been found. The experiments have been extended to study in more detail the irregularity in the absorption at this thickness. The emulsion technique has been used.

4. Electromagnetic Waves in Anisotropic, Inhomogeneous Plasmas. By M. P. Bachynski and K. A. Graf. Presented by G. A. Woonton, F.R.S.C.

The general equations for time harmonic, electromagnetic fields in unbounded non-homogeneous, anisotropic media are set down using the notion of a tensor dielectric coefficient whose elements may be functions of position in the medium. The general equations can readily be reduced to a vector differential equation or equivalently to a set of component scalar equations in terms of the magnetic vector. The more specialized cases of electromagnetic waves in isotropic inhomogeneous, anisotropic homogeneous, and isotropic media are contained in the general relations.

Application of the boundary conditions for the case of a plane wave incident at an arbitrary angle on a flat, free space-plasma boundary yields expressions for the refracted and reflected electromagnetic fields. It is found that for uniform, isotropic plasmas, the energy in the plasma propagates, on the average, in a direction normal to the phase fronts for "horizontally polarized" incident waves, while for "vertically polarized" incident waves the direction of energy travel is, in general, not normal to the phase fronts. In both cases, the waves in the plasma are not plane waves (except at normal incidence or if the plasma is lossless). The reflected waves, however, are plane waves. An anisotropic plasma, on the other hand, can support two electromagnetic waves which are, in general, elliptically polarized, non-planar, and which carry energy in a direction which is not normal to the planes of constant phase. A linearly polarized incident wave becomes elliptically polarized upon reflection (except if the incident wave is either exactly in the plane of incidence or exactly normal to the plane of incidence). A number of the results can be universally represented in convenient form in co-ordinates representing the real and imaginary parts of the dielectric coefficient, i.e., the "dielectric coefficient plane."

5. Nuclear Physics Research with the Aid of a Linear Electron Accelerator. By L. Katz, F.R.S.C.

Recent advances in the design of linear electron accelerators have made them into a powerful tool for certain types of research in nuclear physics. These accelerators may be used to produce beams of (*a*) fast electrons, (*b*) positrons, (*c*) X-rays, or photons whose energy lies within a narrow energy interval ΔE so that $\Delta E/h\nu < 1$, and (*d*) intense pulses of neutrons. Projected experiments making use of each of these four beams will be discussed.

SYMPOSIUM ON PHYSICAL ORGANIC CHEMISTRY

Convener: A. N. Bourns

Wednesday, 9.30 a.m.

1. Activation Energy Dependence on Solvent Composition for some Organic Reactions in Binary Solvent Mixtures. By J. B. Hyne. Presented by R. McIntosh, F.R.S.C.

The maxima and minima observed in the plot of activation energy *versus* solvent composition for solvolysis of alkyl halides, benzene-sulphonates and sulfonium salts in binary solvent mixtures has been interpreted as a reflection of preferential solvation of the re-

acting solute species by one or other of the solvent components (Hyne, JACS **82**, 5129 [1960]). This interpretation is reviewed briefly and extended to account for the observed activation energy dependence on solvent composition in further examples of solvolytic and non-solvolytic type reactions.

The cases considered include examples of reactions between ions of the same and opposite signs, the hydrolysis of carboxylic acid esters and lactones, decarboxylation, quaternization reactions, and the ammonium cyanate-urea conversion. The effect of specific solvation, as manifest in the activation energy behaviour as a function of solvent composition, is shown to have considerable potential as a tool for investigating the detailed nature of charge distribution changes taking place in the rate-determining step of reactions in solution.

2. Isotope Effects and the Mechanism of Solvolysis. By R. E. Robertson. Presented by L. Marion, F.R.S.C.

Recent investigations of deuterium isotope effects in the general reaction

$$RX + H_2O \rightarrow ROH + H^+ + X^-$$

provide a useful source of information about the detailed mechanism of solvolysis. Thus, substitution of D_2O for H_2O permits conclusions to be drawn from the solvent isotope effect (k_{D_2O}/k_{H_2O}) concerning the solvation changes accompanying the activation process. Somewhat more subtle questions may be posed by substitution of D for H at various positions in the *R*-group. In certain cases the results merely confirm concepts derived from other sources. In others, a new insight is given into the configuration of the transition state. Examples are given to support these conclusions.

While the substitution of deuterium for hydrogen in such cases frequently leads to apparently unambiguous conclusions, recent results obtained in this laboratory suggest that the interpretation of secondary deuterium isotope effects may be far less simple than has been assumed. For example, in at least three systems we have found that k_H/k_D is not temperature dependent—results inconsistent with those hypotheses which attribute a large part of this isotope effect to zero point energy differences.

3. Hydration Effects and Acidity Function Scales. By J. T. Edward. Presented by C. A. Winkler, F.R.S.C.

Hammett assumed that the ionization in aqueous acid of compounds (B), which could be shown cryoscopically to be monoprotonated in absolute sulphuric acid, could be represented by the equation

$$BH^+ \rightleftarrows B + H^+ \tag{1}$$

and that their ionization ratio $[BH^+]/[B]$ followed the empirically-determined acidity function h_0 according to the equation

$$[BH^+]/[B] = h_0/K_{BH^+}. \tag{2}$$

These equations take no account of the differing hydration of the ions or molecules. If this is to be done, equation 1 must be replaced by

$$BH^+ . mH_2O + n\,H_2O \rightleftarrows B . pH_2O + H^+ . (m + n - p)H_2O, \tag{3}$$

and equation 2 by

$$[BH^+]/[B] = h_0 K'_{BH^+} a_{H_2O}{}^{(n-x)} \tag{4}$$

where x is the number of water molecules involved in the ionization of the indicator (In) employed by Hammett to establish the acidity function for the acid range being considered:

$$(5) \qquad In\mathrm{H}^+ . y\mathrm{H_2O} + x\mathrm{H_2O} \rightleftarrows In(x + y + p - m - n)\mathrm{H_2O} + \mathrm{H}^+ . (m + n - p)\mathrm{H_2O}.$$

It is shown that the ionization of amides may be explained on the assumption that $n < x$, and the ionization of thioureas on the assumption that $n > x$. The Hammett-Zucker and the Bunnett equations for the rates of acid-catalysed reactions are consequences of equation 4.

In similar fashion, the proton-abstracting power of strong solutions of sodium hydroxide i.e., the acidity function $h-$) is shown to be dependent on the hydration of the ions and molecules involved in the equilibrium

$$(6) \qquad \mathrm{AH} + \mathrm{OH}^- \rightleftarrows \mathrm{A}^- + \mathrm{H_2O}.$$

4. Conformational Analysis of the 1,3-Dioxolane Ring System. By R. U. Lemieux, F.R.S.C., R. R. Fraser, and J. D. Stevens.

The geometry of the 1,3-dioxolane ring has been investigated by the nuclear magnetic resonance technique. The spectra of several 2,2-dimethyl-1,3-dioxolanes bearing substituents of varying size in the 4-position have been measured and analysed with the aid of a computer. The observed variation in the magnitude of coupling constants which is dependent upon the magnitude of the dihedral angle between vicinal protons is interpreted as a reflection of changes in population of conformations. The geometry of these conformations will be discussed.

5. The Role of the Ylide Mechanism in the Hofmann Elimination Reaction of Quaternary Ammonium Salts. By G. Ayrey and A. N. Bourns. Presented by H. G. Thode, F.R.S.C.

Nitrogen isotope effect studies have shown that in the transition state of the *cis*-elimination reaction of *trans*-2-phenylcyclohexyltrimethylammonium iodide with ethoxide ion the carbon-nitrogen bond is still essentially intact. The mechanism of the reaction has been investigated by means of deuterium tracer and exchange studies on *trans*-2-phenyl-[2-*d*]-cyclohexyltrimethylammonium iodide. It has been demonstrated that, despite an unfavourable geometry for reaction by a concerted mechanism, the *cis*-elimination does not proceed through an ylide intermediate, such as has been proposed by Weygand for the high-temperature reaction of trimethylethylammonium hydroxide. It may therefore be concluded that the ylide mechanism is not an important reaction pathway in the decomposition of quaternary ammonium salts under kinetic conditions.

INDEX, SECTION III

Light-face figures indicate the number of the article, **bold-face** figures the number of the page

SECTION IV. GEOLOGICAL SCIENCES

GÉOLOGIE

Monday, June 5

10.00 A.M.—General meeting.

11.00 A.M.—Society Symposium.

2.00 P.M.—Business meeting of the Section, Room 106, Physical Sciences Centre.

3.00 P.M.—Presidential Address: "Origin of Continents." By J. E. Gill, F.R.S.C.

General papers (see abstracts below).

Tuesday, June 6

9.00 A.M.—General papers continued and Sectional Symposium: "Tectonics of the Canadian Shield." Room 106, Physical Sciences Centre.

2.00 P.M.—Joint Symposium: "Possibilities of Colonization of Northern Canada"—Sections III, IV, and V. Auditorium, Physical Sciences Centre.

Wednesday, June 7

9.00 A.M.—Sectional Symposium, "Tectonics of the Canadian Shield," continued. Room 106, Physical Sciences Centre.

2.00 P.M.—Business meeting of the Section.

4.00 P.M.—General meeting of the Society.

5.00 P.M.—Council meeting.

Monday, 3.30 p.m.

1. *Bolboporites americanus* in the Chazy of Southern Quebec. By T. H. Clark, F.R.S.C., and H. J. Hofmann.

A study of over 250 specimens of *Bolboporites americanus* Billings from the Chazy group of southern Quebec has revealed new information on the character of this fossil. In any one locality it occurs in a variety of shapes ranging between prolate, globular, and conical end

members. The fossils are interpreted as specialized spines of cystids, possibly of the hydrophorid *Palaeocystites tenuiradiatus* (Hall), with which they are commonly associated. A correlation between spine shape and position on the calyx is suggested.

2. Succession and Variation of *Monotis* in British Columbia. By G. E. G. Westermann. Presented by H. S. Armstrong, F.R.S.C.

An exceptionally well-preserved *Monotis* fauna from the Pardonet "beds" of the upper Pine River valley permits the distinction of five range zones respectively characterized by: *M. ochotica* (Keys.) *posteroplana* nov.; *M. subcircularis* Gabb; *M. callazonensis* nov. + *M. jakutica* (Teller); *M. Ochotica densistriata* (Teller); and *M. scutiformis* (Teller) *pinensis* nov. This sequence is compared with other *Monotis* occurrences and age, faunal relations, and adaptations are discussed. Statistics display the variation, correlation, and growth in six to eight measured valve characters for each sample and assist in taxonomy and phylogeny.

3. Profile of the Fossil Crater at Brent, Ontario. By M. J. S. Innes and C. S. Beals, F.R.S.C.

Ten drill holes were sunk in the area of the Brent crater to study its pre-deposition profile and other physical characteristics. Palaeozoic sediments in the centre were found to have a depth of 850 feet, decreasing steadily towards the circumference.

The crater surface consisted of gneiss breccia, fragments ranging from 0.1 millimetre to a metre or more. The profile was consistent with that of an eroded meteorite crater of original diameter 14,000 feet and depth 1780 feet. The layer of fragmented rock was found to extend, in the centre, to a depth of 2450 feet below the crater floor.

4. Ventifacts and Eolian Sand at Charette, P.Q. By T. H. Clark, F.R.S.C., and J. A. Elson.

The keels on 250 ventifacts, mostly einkanters, from stratified drift near Charette, P.Q., have a preferred azimuth of about 165°. The poles of the facets are concentrated at about 75° azimuth and plunge at about 55°. The effective wind as determined from the threshold velocity for the Charette sand and meteorological data for Montreal and Quebec is northeast, though prevailing winds are from the west. The attitude of wind-cut facets apparently indicates the direction of the strongest effective winds. Sand dune morphology and grain-size distributions suggest a wider range of effective wind directions ranging from northwest to northeast.

5. Revisions in the Early History of the Retreat of the Wisconsin Glacier in Ontario Based on the Calcite Content of the Sands. By L. J. Chapman and C. I. Dell. Presented by G. B. Langford, F.R.S.C.

In an attempt to explain the origin of an abundance of calcite in Norfolk sands, over eighty soil samples were analysed for calcite and dolomite. These analyses, together with a re-examination of the moraines and meltwater drainage channels north of Orangeville, have indicated the origin of the calcite and incidentally pointed out errors in existing glacial history. They have prompted the conclusion that the Singhampton moraine south of

Hornings Mills was formed between the Lake Simcoe ice lobe on the east and the Georgian Bay lobe on the west. It may be regarded as an extension of the Orangeville moraine and was the source area for the abundant calcite found in the Orangeville and Waterloo moraines. The major meltwater drainage channel which runs in front of the Gibraltar moraine leads southward in front of the Paris moraine indicating that these two moraines are contemporaries. Calcite carried from the Trenton and Black River limestones in the Lake Simcoe area to the top of the Niagara escarpment was carried by the drainage waters to be deposited in glacial Lake Whittlesey in the Norfolk sands.

Tuesday, 9.00 a.m.

6. Aqua Regia Extractable Lead and Molybdenum in Eruptive Rocks. By Harry V. Warren, F.R.S.C., and Robert E. Delavault.

Various bodies of eruptive rock in southern British Columbia were sampled and analysed for lead and molybdenum, as well as for copper and zinc. The results indicate that each eruptive body tends to have a characteristic assemblage of trace elements, and that these trace element assemblages may be useful both in correlating rock masses and in determining which areas are most attractive for prospecting. In this type of work, chemical methods seem, at present, to be more applicable than either spectroscopic or X-ray fluorescence techniques.

7. Sampling Errors in Geochemistry. By Denis M. Shaw. Presented by H. S. Armstrong, F.R.S.C.

Interpretative comparisons of rock composition require knowledge of the range of variation of each type as well as its mean value. The variate is composition (x_i) or some related function (for example, log x_i) and its range is measured by the sample variance estimate s^2.

This estimate s^2 is, however, biased because it includes components which arise from sampling (s_s^2), crushing and quartering (s_c^2), and analytical (s_a^2) errors. The true or geochemical variance is s_g^2 where

$$s_g^2 = s^2 - s_s^2 - s_c^2 - s_a^2.$$

Theory and applications are discussed, indicating empirical corrections which may be used.

8. Extent of the Huronian System between Lake Timagami and Blind River, Ontario. By James E. Thomson, F.R.S.C.

Recent field work has traced Huronian rocks from Lake Timagami to Lake Wanapitei and thence at intervals north of the Sudbury basin through the Milnet and Cartier areas, then south through the Agnew Lake area and westward to Blind River. There is no good evidence of Huronian formations south of Sudbury or anywhere between the Murray (Worthington) fault and the north shore of Lake Huron.

Because of great deformation, and because Huronian and pre-Huronian rocks cannot be separated by lithology alone, the term "Unclassified Precambrian" would best describe the present stratigraphic and correlational status of the sedimentary rocks south of the Murray fault. The evidence tends to support a pre-Huronian age for this unit.

Section IV

9. Recognition of the Quartzite Breccia in the Whitewater Series, Sudbury Basin, Ontario. By John S. Stevenson, F.R.S.C.

Quartzite breccia has been identified in the South Range, Sudbury Basin, in the Whitewater series, where it comprises the base of the Onaping formation. This siliceous rock had first been called conglomerate, then pyroclastic breccia, and, most recently, rhyolite and rhyolitic breccia.

During field and laboratory studies over the past nine years, it has been seen that much of the rock was drag-folded and tectonically-transported material. Six recent chemical analyses of the quartzite breccia have shown a silica content ranging from 86.8 per cent to 91.4 per cent SiO_2, emphasizing the sedimentary origin of the original rock.

10. Complex Folding and Associated Minor Structures on Reno and Waldie Mountains, Southeastern British Columbia. By W. W. Moorhouse, F.R.S.C.

Complex disharmonic folding in a series of dolomites, limestones, and argillites, on the west side of the Sheep Creek anticline, is illustrated by means of a series of cross-sections. The distribution of cleavage, drag-folding, and other minor structures with respect to the major structures are discussed.

11. Stratigraphy and Structure of the Precambrian Old Fort Point Formation, Jasper Anticlinorium, Canadian Rocky Mountains. By C. R. Evans and H. A. K. Charlesworth. Presented by R. E. Folinsbee, F.R.S.C.

About 1200 feet of argillites, siltstones, and intraformations limestone-breccias belonging to the Precambrian Old Fort Point formation are exposed in the Jasper anticlinorium. Deposition occurred in moderately shallow water with slumping down a westerly slope leading to the development of the breccias. The anticlinorium consists of several northwesterly trending, doubly plunging, tight folds overturned to the northeast. Attitude of joint-sets and variation in the attitude of flow-cleavage indicate changes in orogenic stress-field orientation in space and time. Metamorphic minerals developed during the Laramide orogeny include chlorite, muscovite, quartz, albite, and calcite.

SYMPOSIUM ON TECTONICS OF THE CANADIAN SHIELD

12. Some Aspects of Phanerozoic Epeirogenic and Orogenic Events that Involve Precambrian Rocks. By R. J. W. Douglas, F.R.S.C., and S. Duffell.

Information available from study of the sedimentary rocks that constitute the cratonic cover indicate the nature of the deformation the exposed parts of the Precambrian Shield have undergone during Phanerozoic time. Special aspects of volcanism, caldera subsidence, and normal faulting which affect the shield are considered. The involvement of Precambrian crystalline and stratified rocks in structures of the orogenic belts adjoining the craton are reviewed.

13. The Tectonics of the Canadian Shield in Relation to those of the Adjoining Sedimentary Basins. By J. C. Sproule, F.R.S.C.

The paper relates to the tectonic history of localized mobile belts on exposed portions of the Canadian Shield and within the adjoining sedimentary basins, with special reference to those zones and tectonic belts that pass from one geological province to another and with reference to the effects of chronic tectonic activity through geological time on the segregation and accumulation of mineral deposits. Particular stress is placed on the related generation and accumulation of hydrocarbons in the sedimentary basins and on the usefulness of photogeology in detecting these belts within the sedimentary basins.

14. Yellowknife-Nonacho Age and Structural Relations. By R. A. Burwash and H. Baadsgaard. Presented by P. S. Warren, F.R.S.C.

In southeastern District of Mackenzie, granites have been mapped as pre- and post-Nonacho series. The basal Nonacho conglomerate contains boulders giving K/A dates on muscovite of 2400 million years. The underlying gneissic complex, which is highly chloritized, gives biotite dates of 1800 million years, and probably represents a basement of Yellowknife age reactivated during the Churchill orogeny. The Nonacho-granite contact is mapped as unconformable where a basal conglomerate is present, intrusive where the basal beds are metarkose.

The Nonacho series and the Great Slave group were both deposited on a shelf of the Yellowknife craton, which may have extended as far south as Lake Athabasca.

15. Structural Pattern of the Precambrian Shield in Northeastern Alberta, and Mica Age-dates from the Andrew Lake District. By John D. Godfrey and H. Baadsgaard. Presented by R. E. Folinsbee, F.R.S.C.

The regional fold and fault pattern of about 3600 square miles of the Shield in northeastern Alberta has been outlined with the aid of vertical aerial photographs and information from ground work in a limited part of the area. Results of an aeromagnetic survey fit into the structural framework and also correlate very well with the distribution of major rock types based on the ground work. Potassium-argon dates have been determined on micas selected from the major rock types of the mapped area. Biotites from the northern end of Andrew Lake fall in the range 1.7 to 1.9 billion years.

16. Major Faults in the Canadian Shield of Saskatchewan. By A. R. Byers, F.R.S.C.

Two periods of major faulting occur. Early faults are characterized by shearing, mylonitization, and recrystallization of material within the fault zones. They are probably related to major orogenic forces. Late faults are marked by zones of intense shearing and brecciation, by diapthoresis and hydrothermal alteration, and by topographic lineaments. They were initiated during the Proterozoic and movements along them had virtually ceased by the Cambrian. Some at least are considered to be related to stresses of a shield-wide nature.

Wednesday, 9.00 a.m.

17. Tectonics of the Canadian Shield in Northern Manitoba. By H. D. B. Wilson, F.R.S.C., and W. C. Brisbin.

Section IV

The major tectonic feature in northern Manitoba is the boundary between the Churchill and Superior blocks of the Precambrian Shield. The authors have previously compared the structure of this boundary to that of an island arc or alpine mountain range. The present paper is a synthesis of the available geological and geophysical data and presents the more detailed structure of the boundary. The nature and structure of the rocks in the Superior and Churchill blocks are compared and contrasted.

18. Operation Overthrust. By R. N. Parkinson. Presented by M. E. Hurst, F.R.S.C.

Operation Overthrust is a compilation, at a scale of 1 in. = 1 mile, of aerial photography and geology over an area of some 350,000 square miles extending from Lake Winnipeg to Lake Mistassini.

It is primarily an attempt to provide a bibliography of geological data compiled to date and to integrate this information with the results of geological interpretation of aerial photographs over the same area.

Approximately 15,000 photographs were examined stereoscopically and the observed structural data transferred to translucent overlays to mosaics.

In editing this data down to four miles and again to eight miles to one inch, a number of interesting regional structural anomalies have been observed which may add a little more to our knowledge of the tectonics of the Canadian Shield.

19. Some Tectonic Features of the Grenville Province of Ontario. By D. F. Hewitt, F.R.S.C.

Tectonic features exhibited in an area are dependent upon the depth zone of their formation, the nature and magnitude of stresses, the general competency of rock units involved, and the presence or absence of incompetent rock units such as marble.

The tectonic style of structural features formed in the catazone are contrasted with those of the mesozone and epizone. The Grenville Province of Ontario exhibits features of the catazones and mesozones.

Examples are given of tectonic features in the French River area, the Cardiff-Anstruther arch, and the Hastings Basin. Tectonic features in these areas are greatly influenced by the characteristics and mode of emplacement of the plutonic elements, which range in composition from granitic to intermediate. Granitic intrusives appear to exhibit characteristics of Read's granite series.

Fold types range from flowage domes of the catazone to crossfold dome and basin structures of the mesozone. Linear horizontal folds and plunging troughs and anticlines are also present. Foliation is predominantly stratiform. Lineation of the A and B type occur in different environments in catazone and mesozone.

20. Tectonics of Part of the Grenville Sub-province in Quebec. By F. Fitz Osborne, F.R.S.C., and Marcel Morin.

The Grenville sub-province in Quebec southwest of a line through Mistassini Lake and Baie Comeau can be divided into two tectonic units, each of which shows characteristic lithologic features. In addition to the main units, certain minor units are recognized.

21. Tectonics of Regions Bordering the Ungava Stable Area. By Robert Bergeron, Jean Bérard, and Léopold Gélinas. Presented by H. W. McGerrigle, F.R.S.C.

This paper outlines the tectonic framework of the Cape Smith-Wakeham Bay belt, the Labrador geosyncline, the Mistassini-Otish Basin, and the Belcher Basin. These areas are respectively north, east, south, and west of the Ungava stable area. The structure of particular areas within these regions is given in some detail.

22. The Shape of the Canadian Shield. By Yves Fortier, F.R.S.C.

The shape of the Canadian Shield lends itself to tectonic analysis. Several major axes of flexure occur within the Shield and are parallel both to the borders of the Shield and to the recent tectonic belts within it.

23. On the Relation of Metal Occurrences to Tectonic Divisions of the Canadian Shield. By A. H. Lang, F.R.S.C.

A preliminary study of the distribution of Canadian metal occurrences was completed recently. The writer was asked to compare the results with the subdivisions of the Canadian Shield proposed by Stockwell in this symposium. The distribution of metals shows some correspondences and some differences with those divisions. The most marked correspondences are with the Bear, Slave, and Grenville provinces. Several relations to smaller areas and belts which probably can be regarded as tectonic sub-provinces will also be discussed.

24. A Tectonic Map of the Canadian Shield. By C. H. Stockwell, F.R.S.C.

The preparation of a new Tectonic Map of Canada is being undertaken jointly by the Geological Association of Canada, the Alberta Society of Petroleum Geologists, and the Geological Survey of Canada. A preliminary, much simplified map of the Canadian Shield is presented. Isotopic age determinations indicate the presence of three major orogenic periods and this information, when considered in relation to main unconformities, permits the rocks to be mapped according to their age of folding, metamorphism, or intrusion. Areas involved in more than one period of deformation are differentiated where possible and areas of flat-lying or relatively unfolded rocks are distinguished from those affected by major orogenies. Generalized trend lines and main gravity anomalies are also shown.

25. Isotopic Studies as an Aid in Interpreting Tectonics. By R. M. Farquhar, M. Ozima, and J. T. Wilson, F.R.S.C.

The isotopic data available for the Canadian Shield will be discussed in so far as they are guides to the interpretation of the tectonics of that region.

SECTION V. BIOLOGICAL SCIENCES
SCIENCES BIOLOGIQUES

Endocrinological Problems

Chairman: D. L. Thomson, F.R.S.C.

Monday, June 5

2.00 P.M.—Storage and Release of Catecholamines from the Adrenal Medulla. By A. d'Iorio.

2.30 P.M.—Humoral Control of Parathyroid Function in the Dog. By D. H. Copp, F.R.S.C., Barbara Cheney, and A. George Davidson.

Protection by Systemic Stress against the Induction of Various Organ Lesions. By H. Selye, F.R.S.C., M. Cantin, P. Jean, and E. Bajusz.

3.15 P.M.—Attempted Reconstruction of the Pituitary-Adrenal Response to Stress. By M. Saffran.

3.45 P.M.—Hormone Dependency and the Mammary Gland. By R. L. Noble, F.R.S.C.

4.15 P.M.—Mode of Formation of the Thyroid Hormone. By C. P. Leblond, F.R.S.C. (Flavelle Medal Address).

Genetics and Related Subjects

Chairman: D. L. Thomson, F.R.S.C.

Tuesday, June 6

9.30 A.M.—Principes et possibilités de la microscopie à fluorescence en microbiologie. By J. deRepentigny.

10.00 A.M.—Should Concepts of Sex Determination in Mammals be Revised? By D. Carr and M. Barr, F.R.S.C.

10.30 A.M.—Recent Advances in Virus Mouse Leukemia. By A. A. Axelrad.

11.00 A.M.—Recent Advances in Experimental Teratology. By F. C. Fraser.

11.30 A.M.—The Two Biologies. By C. F. Robinow, F.R.S.C.

Nervous System

Chairman: D. L. Thomson, F.R.S.C.

Wednesday, June 7

9.30 A.M.—The Nervous System and Its Influence on Some Aspects of the Milieu Intérieur. By L. Poirier.

10.00 A.M.—Amino Acids and the Activity of the Brain. By K. A. C. Elliott.

10.30 A.M.—Protective Mechanisms against Nerve Poisons in Insects. By A. W. A. Brown, F.R.S.C.

11.00 A.M.—Evidence for and Application of the Concept of Specific Tissue Receptors. By M. Nickerson.

11.30 A.M.—Brain Responses to Normal Vision. By B. D. Burns.

1. Storage and Release of Catecholamines from the Adrenal Medulla. By Antoine D'Iorio.

In recent years many experiments have been conducted to determine the composition, role, and function of the chromaffin granules of the adrenal medulla. It is believed that these storage granules are essentially osmotic bags with a phospholipidic membrane. The amines are not, however, simply in solution within these granules; they apparently form a labile complex with ATP and protein. Although the various components of this complex have been characterized it has up to now been impossible to demonstrate the existence of the complex.

The release of the amines *in vivo* can be brought about by two different procedures, stimulation of the splanchnic nerve or direct action on the storage granules. Many of the physiological conditions leading to a discharge of adrenaline (i.e., transient hypoglycaemia, etc.) generally proceed by stimulation of the splanchnic nerve. The chemical changes occurring in the storage granules during this stimulation have been investigated and will be discussed.

More recently it has been shown that substances such as tyramine, certain adrenolytic drugs, and cocaine which are *in vivo* liberators of adrenaline will also have a direct *in vitro* effect on the chromaffin granules. The mechanism involved in this release is different from the one observed during splanchnic stimulation. It is possible that the above-mentioned substances have more affinity for the ATP-protein complex and would thus displace the catecholamines.

2. Humoral Control of Parathyroid Function in the Dog. By D. Harold Copp, F.R.S.C., Barbara Cheney, and A. George Davidson.

A sensitive humoral control of parathyroid function has been demonstrated in anaesthetized dogs in which the isolated thyroid-parathyroid glands were perfused *in situ* or *in vitro* with high calcium or low calcium blood. Stimulation with hypocalcemic blood released

a calcium mobilizing substance resembling parathyroid hormone which caused a rise in plasma calcium beginning within 30–60 minutes. Changes in inorganic phosphate were not consistent, although in general the level rose. Perfusion of the parathyroids with high calcium blood caused a prompt fall in systemic blood calcium. Evidence was obtained to indicate that this fall was due to the positive action of a new parathyroid factor, and not merely the suppression of production of parathyroid hormone. The changes in parathyroid function were sufficiently rapid to account for the acute homeostatic control of blood calcium.

3. Protection by Systemic Stress against the Induction of Various Organ Lesions. By H. Selye, F.R.S.C., M. Cantin, P. Jean, and E. Bajusz.

Stress can diminish resistance to various pathogens, but, under certain conditions, it can also exert a protective effect. For example: restraint, trauma, and diverse toxic substances can prevent the usual production of cardiac necroses by papain, pulmonary edema by adrenalin, tissue calcification by dihydrotachysterol, and anaphylactoid reactions by egg-white or dextran, in the rat. Only in some of these instances (anaphylactoid and inflammatory reactions) is the protective effect of stress mediated through the discharge of glucocorticoids. The extra-adrenal mechanisms through which stress induces non-specific resistance will be discussed in relation to phenomena of specific resistance (e.g., to papain and bromelain).

4. Attempted Reconstruction of the Pituitary-Adrenal Response to Stress *in Vitro*. By Murray Saffran.

The events that follow a stressful stimulus may be summarized as follows: stress → part of the central nervous system → release of a corticotrophin-releasing factor → anterior lobe of the pituitary → release of corticotrophin → adrenal cortex → formation of corticosteroids → influence metabolism of target tissues.

During the past ten years we have studied parts of this sequence using isolated tissues in an attempt to learn what factors influence each part. The action of corticotrophin on the isolated adrenal cortex of the rat has been studied in detail and has resulted in the development of a convenient assay for corticotrophin. The release of corticotrophin from the isolated pituitary gland is being studied now and has led to the development of an assay for the corticotrophin-releasing factor. Our present work is concerned with the characterization of the corticotrophin-releasing factor and kindred substances of the brain.

At present, the following events can be reproduced *in vitro*: corticotrophin-releasing factor → anterior pituitary → release of corticotrophin → adrenal cortex → formation of corticosteroids. In the future we plan to study the control of the secretion of the corticotrophin-releasing factor in response to stress and thus approach more closely our aim of reconstructing the entire system *in vitro*.

5. Hormone Dependency and the Mammary Gland. By R. L. Noble, F.R.S.C.

The mammary gland is controlled through a complex hormone mechanism. At least 3 steroid hormones, 2 anterior pituitary hormones, 1 posterior pituitary hormone, and insulin probably have a direct participation in mammary gland development and function. An interesting new development has been the study of hormones in preserving function in

mammary tissue organ culture. Both benign and malignant tumours of the breast show hormone dependency for growth and survival. On the other hand, such tumours may show a gradual loss in hormonal control until complete autonomy develops.

6. La Microscopie à fluorescence en microbiologie. By Jacques deRepentigny.

L'emploi relativement récent de la microscopie à fluorescence en microbiologie, a revêtu surtout un caractère pratique : détection du bacille tuberculeux, diagnose immunologique à l'aide des anticorps fluorescents.

Pour notre part, nous avons étudié systématiquement, depuis 1953, les propriétés de la fluorescence des microorganismes avant et après traitement par des fluorochromes divers. Nous avons mis en évidence l'importance des couleurs observées et celle de l'intensité de la fluorescence primaire des microorganismes.

Au moyen de notre méthode de microfluorométrie, nous avons introduit des éléments quantitatifs et objectifs dans la microscopie à fluorescence qui peuvent donner lieu à des applications intéressant la cytologie, la taxonomie, l'analyse de fractions microbiennes et le diagnostic rapide des maladies infectieuses.

7. Should Concepts of Sex Determination in Mammals be Revised? By David H. Carr. Presented by Murray L. Barr, F.R.S.C.

The classical studies of C. B. Bridges on Drosophila established that male-determining genes are carried on the autosomes and female-determining genes on the X-chromosome. In Drosophila, the Y-chromosome is relatively inert. It has been assumed that a similar genetic balance forms the basis of sex determination in mammals.

Recent cytogenetic studies on the mouse, and especially on man, suggest that the generalization of Y-chromosome inertness is not valid. On the contrary, the Y-chromosome of man appears to carry potent testis-promoting genes, for the XO individual is a phenotypical female with gonadal aplasia and the XXY (or XXXY) individual is a phenotypical male with nearly normal testes until puberty.

8. Recent Studies on Virus Leukemia in Mice. By A. A. Axelrad.

The thymus gland is necessary for induction of lymphatic leukemia by Gross' virus in mice, and susceptibility is much higher in infant than in adult mice.

We have found that the time when the thymus is growing rapidly and contains many large round cells in mitosis is also the time when susceptibility to the virus is high; when thymus growth stops, susceptibility falls.

When adult mice are exposed to X-irradiation, they become susceptible to induction of virus leukemia, as large round cells in mitosis reappear in their thymus glands.

Susceptibility to leukemia virus thus appears to depend on availability of immature, multiplying lymphoid cells in the thymus.

9. Recent Advances in Mammalian Teratology. By F. C. Fraser.

10. The Two Biologies. By C. F. Robinow, F.R.S.C.

Biology is today discussed in two languages, morphology and chemistry, which cannot be interpreted to each other. Chemical genetics, now the central subject of general biology,

holds that organisms are systems of molecules which act upon each other according to a programme expressed in and set going by the configuration of the molecules of DNA in the germ cells. Difficulties which arise when this concept is seriously applied to embryology and to the theory of evolution will be discussed. It will also be pointed out that the ideas that now dominate biology have been fashioned mainly by naturalists, taxonomists, mathematicians, and chemists and not by those to whom we owe most of our knowledge of the structure of cells and cellular events in development.

11. The Nervous System and its Influence on some Aspects of the Milieu Intérieur. By Louis J. Poirier.

The role played by the nervous system in the adjustment of the milieu intérieur, such as established by Cannon, Ranson, Gellhorn, their associates and others, is becoming more and more clearly defined as several investigators accumulate an impressive amount of data concerning the intermediate mechanisms underlying these subtle functions. The hypothalamus which is itself influenced by the composition of the milieu intérieur, as well as by other nervous centres, plays a prominent role in this interrelationship with the periphery. And the structures within the hypothalamus itself are so organized that although they may influence differently various peripheral mechanisms they appear to be mutually interrelated and fully integrated.

12. Amino Acids and the Activities of Brain. By K. A. C. Elliott.

Certain free amino acids are present and actively metabolized in brain. One of these, γ-aminobutyric acid (GABA), is not found in proteins or in any other tissue. GABA exerts profound effects on the physiological activity of brain. Among the other free amino acids, glutamic acid, from which GABA is produced by simple loss of CO_2, seems to exert effects opposite to those of GABA. Brain produces its energy ultimately by the consumption of glucose but the carbon of glucose is to a considerable extent first converted to amino acids. Convulsing brain consumes mainly amino acids.

Thus the amino acid picture links together oxygen consumption, intermediary metabolism, the regulation of the physiological excitability of brain, and also certain other aspects of brain activity.

13. Protective Mechanisms against Nerve Poisons in Insects. By A. W. A. Brown.

The nervous system of insects is essentially cholinergic, and although non-medullated is protected by connective tissue sheaths against polar compounds such as acetylcholine itself, but not against apolar synthetic insecticides. Secondary nerve toxins of nitrogenous nature may be produced in the haemolymph. Chlorinated insecticides such as DDT, gamma-BHC and dieldrin are physical poisons affecting ionic movement across the axon sheath. Organophosphorus and carbamate insecticides are biochemical poisons inhibiting cholinesterase. The defence mechanisms developed by resistant strains of previously susceptible species are based on new detoxifying enzymes such as DDT-dehydrochlorinase, phosphatase, and carboxyesterase. The inheritance of the enzymic detoxifying character has been found to be genetically monofactorial.

14. Evidence for and Application of the Concept of Specific Tissue Receptors. By Mark Nickerson.

Pharmacologically active chemicals can produce their effects only by interaction with constituents of biological systems, which are by definition "receptors." Current studies are providing a basis for using the concept of specific receptors to characterize and classify pharmacological responses. Evidence will be presented to show (*a*) that drug-receptor interactions can distinguish between very similar drugs or receptors, (*b*) that activation of individual receptors is not an all-or-none process, and (*c*) that tissues contain a considerable number of "excess" receptors. The drastic effects of the last two observations on classical receptor theory will be discussed.

15. Brain Responses to Normal Vision. By B. Delisle Burns.

Recent experiments with human subjects have shown that small, involuntary movements of the eyes are essential to maintained vision. When the image of a visual field is prevented from moving relative to the human retina, perception fails after a few seconds.

Contemporary techniques have made it possible to record the activity of single nerve-cells in the brains of experimental animals. We have examined the responses of neurons in the visual cerebral cortex to excitation of the eyes with patterns in the visual field. The results indicate the meaning of "seeing" and show clearly that no object can be perceived unless the observers' eyes are in a state of continual fine motion.

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ABONNEMENTS

Prière d'établir les chèqus, relatifs à làabonnement aux publications de la Société royale du Canada, à l'ordre de la Société royale du Canada, Immeuble du Conseil national de recherches, promenade Sussex, Ottawa (Canada). Le volume XLVI (relié) de 1952 et tout volume subséquent, $14; les Procès-verbaux, $2; les Mémoires réunis des Sections I et II, $3; les Mémoires des Sections III, IV, et V, $2 chaque volume.

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